Regency® COMMUNICATIONS, INC.

SERVICE MANUAL

POCKET ALERT MONITOR

MODEL MCM-H11

1227 S. PATRICK DRIVE
SATELLITE BEACH FLA

0300-4200-800

PRINTED IN USA
1/81

CONTENTS

MCM-H11 PERFORMANCE SPECIFICATIONS

(MICROCOM SELECTIVE CALL ALERT MONITOR)

Frequency Range	148-174 MHz Low Band 148 to 160
	High Band 160 to 174
Type of Operating	Tone and Voice
	Automatic listen model
	with monitor function
R.F. Input Impedance	50 ohms
Voltage Source	DC 3.9 Volts Nickel-Cadmium
	DC 4.2 Volts Mercury
Operating Temperature Range	-10°C to 50°C
Channel Spacing	30 KHz
Modulation Acceptance	±5 KHz
Selectivity	-64dB (EIA Method)
20dB Quieting Sensitivity	
Chassis	0.5µV
Field	25 µV per meter
Squelch Sensitivity	0.3µV
Spurious and Image Rejection	50dB
Frequency Stability	±0.0025% (+25°C reference)
Audio Output	More than 140mW
Power Consumption	10mA (Stand-by)
	80mA (at rated audio output)
Decoder System	Two-tone Sequential

SECTION 2 - OPERATION

2-1 PRE-OPERATIONAL NOTES

Remove the monitor from the shipping carton and inspect it for any obvious damage. If you determine there is no physical damage to the monitor, install the battery as outlined in the Battery Replacement section of this service manual. Test each unit that you have received for proper operation in the alert system. Record the alert code on the control panel. Instruct the user in the proper care and use of the unit.

2-2 STANDARD OPERATION

The mode of operation for this monitor is automatic listen and push to reset, in which the voice message automatically comes on after the alert tone. After the voice message, you must press the reset button to return your monitor back to the standby condition.

a. Rotate the VOL control away from its off position. This turns the monitor on.
b. Listen for a short plink which occurs immediately after turn-on, or listen for a rushing noise, indicating that the batteries are good. Replace or recharge the batteries if you do not hear the plink or rushing noise.
c. Press the RESET button for standby.
d. When you are paged, you will hear a beeping alert tone. Listen for the voice message that automatically follows.
e. Adjust the volume (alert tone and audio message) by turning the VOL control.
f. After receiving the voice message, momentarily depress the reset button to reset the monitor for the next alert.

NOTE: If you accidentally depress the reset button while receiving the message, you will miss the message unless the button is held down until the end of the message.

2-3 BATTERY REPLACEMENT

WARNING - DO NOT DISCARD BATTERIES IN FIRE. THEY MAY EXPLODE.

a. Open the access cover on the bottom of the monitor by pushing it with the thumb in the direction indicated by an arrow.
b. When the cover is removed, the battery is exposed and may be lifted or pried out from the battery compartment.
c. When replacing, insert the battery OBSERVING BATTERY POLARITY indicated inside of the battery compartment.

2-4 BATTERY INFORMATION

The MCM-H11 is powered by a single throw-away battery or rechargeable Nickel-cadmium battery.

a. Throw-away Batteries

The monitor can be operated with an inexpensive throw-away 3.9 volts mercury battery. The ALEXANDER Model H133 or TDI Model TR-133 are recommended for optimum performance of the monitor.

The life expectancy for the mercury battery in normal operation is 120 hours.

b. Rechargeable Battery

The MCM-H11 monitor is normally supplied with a rechargeable Nickel-cadmium battery (MA-413). This type of battery provides about 16 hours of normal operation per full 14 to 16 hours charge.

SECTION 3 - CRYSTAL INSTALLATION

This unit, MCM-H11, is factory adjusted using the center frequency of

$$F(R) = 156 \text{ MHz}$$

In order to adjust for the desired exact frequency, 148 MHz to 160 MHz, follow the method below and refer to Figure 1.

a. 1st Local Oscillator Adjustment:

Connect to the base of Q2 with a 10pf capacitor and make it the measurement point. First, tune coil L5 for maximum L.O. power; next tune trimmer VC2 and adjust frequency.

$$F(L.O.) = F(R) - 21.4 \text{ MHz}$$

After adjustment, remove 10pf capacitor.

b. Sensitivity Adjustment:

b-1 - Connect RF signal of receiving frequency from SSG through antenna connector, and set SSG for 1 KHz modulation ±3 KHz deviation. Adjust AF output to speaker to 90mW.

b-2 - Decrease SSG output and tune the coils L2 and L3 for maximum sensitivity.

b-3 - Disconnect SSG from antenna connector. To increase the output of SSG and to receive RF signal, tune VC1 for maximum sensitivity.

b-4 - Connect SSG to antenna connector again and confirm that 12dB SINAD is below 0.3uV.

If necessary, repeat a and b above.

In case of the 160 MHz to 174 MHz high range the following component value changes are necessary before tuning.

C13	Ceramic	5pf	RH
C15	Ceramic	6pf	RH
C36	Ceramic	7pf	RH

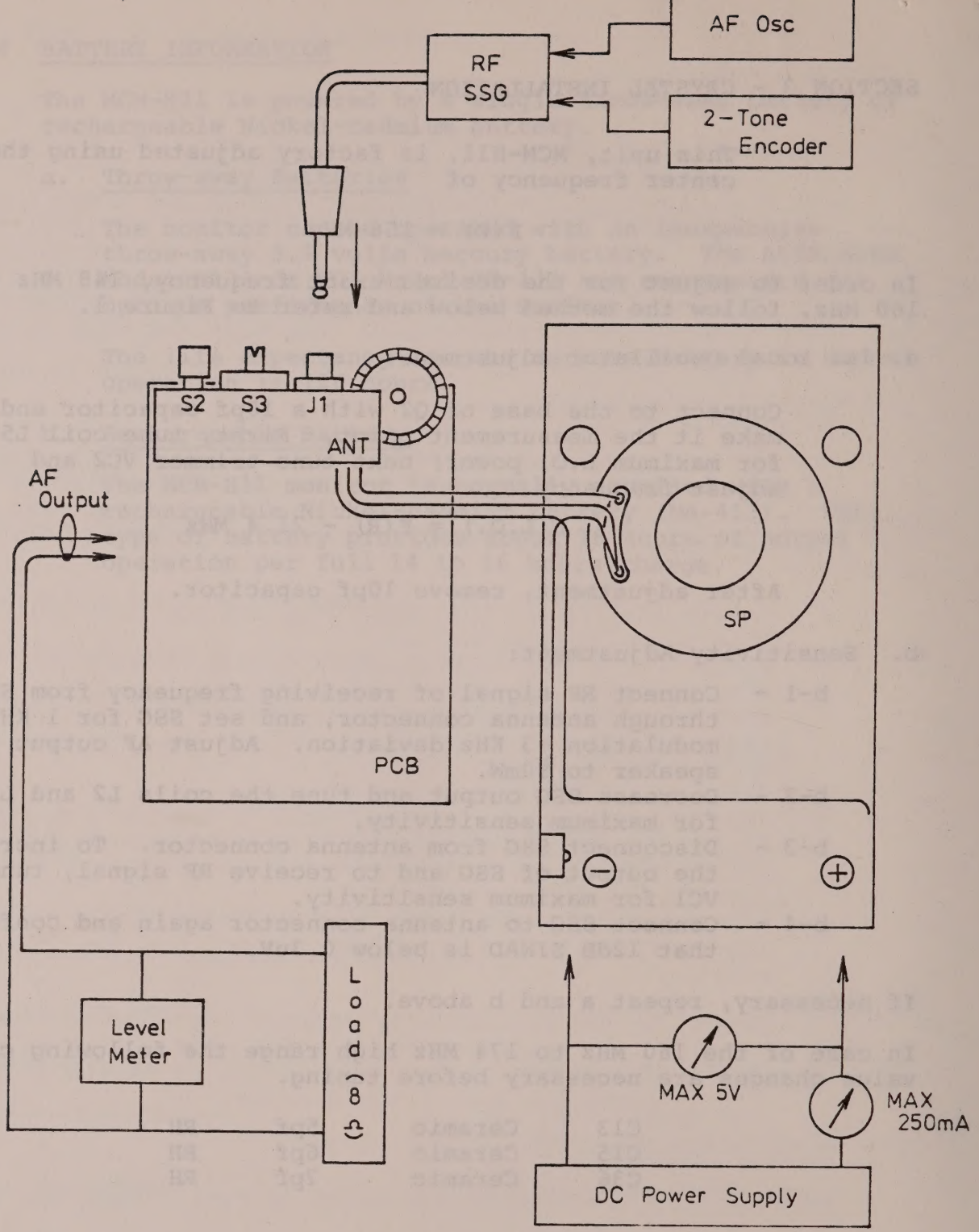


FIGURE 1
MEASUREMENT CIRCUIT

SECTION 4 - TONE CODING

4-1 INTRODUCTION

The MCM-H11 Alert Monitor uses two-tone sequential signaling. Two discrete audio tones are transmitted for a specific period of time. The tones are transmitted as follows (typical timing):

MODE	TRANSMISSION TIME		INTERTIME
	TONE A	TONE B	INTERVAL
INDIVIDUAL CALL	1 sec	3 sec	1.3 sec
GROUP CALL	4 sec	-	-

Each unit in the system responds to a unique combination of tones. This combination is determined by its mechanical reed filters.

There are 60 unique tone frequencies widely used for the individual call. The tone frequency is stamped on the filter body. The filter for Tone B plugs into the socket closest to the edge of the PC board, and the Tone A filter plugs in along side.

The number sheet appears in the small window on the control panel and is the monitor code number. The Tone A and Tone B reed filter code and frequency can be determined from this number. The following section describes the details for coding method.

4-2 CODING PROCEDURE

The 60 available paging tone frequencies are divided in 6 groups of 10 tones each. These groups are numbered and designated to Tone Group 1, Tone Group 2, etc. Table shows the reed codes and frequencies.

TABLE 1 - GENERAL ENCODING PLAN

First Digit of Pager Code	Tone Group From Which Tone A is Selected	Tone Group From Which Tone B is Selected
1	1	1
2	2	2
3	1	2
4	4	4
5	5	5
6	2	1
7	4	5
8	5	4
9	2	4
0	4	2
A	3	3

TABLE 2 - TONE GROUPS

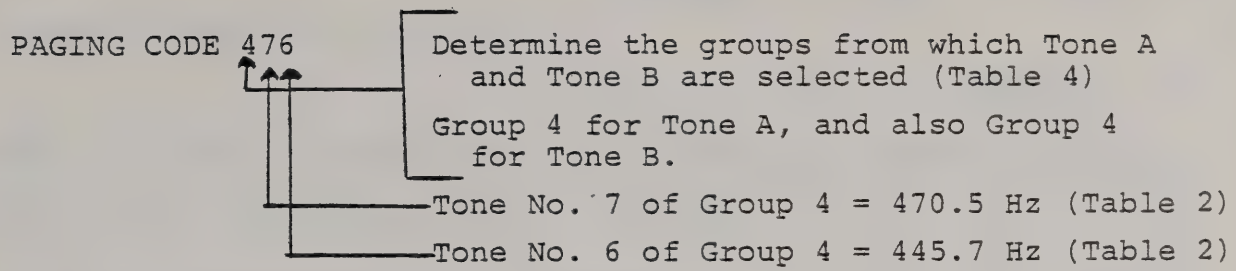
TONE NUMBER	TONE GROUP 1		TONE GROUP 2		TONE GROUP 3		TONE GROUP 4		TONE GROUP 5		TONE GROUP 6	
	FILTER CODE	REQ. (Hz)	FILTER CODE	REQ. (Hz)	FILTER CODE	REQ. (Hz)	FILTER CODE	REQ. (Hz)	FILTER CODE	REQ. (Hz)	FILTER CODE	REQ. (Hz)
1	111	349.0	121	600.9	138	288.5	141	339.6	151	584.8	191	1153.4
2	112	368.5	122	634.5	108	296.5	142	358.6	152	617.4	192	1185.2
3	113	389.0	123	669.9	139	304.7	143	378.6	153	651.9	193	1217.8
4	114	410.8	124	707.3	109	313.0	144	399.8	154	688.3	194	1251.4
5	115	433.7	125	746.8	160	853.7	145	422.1	155	726.8	195	1285.8
6	116	457.9	126	788.5	130	979.9	146	445.7	156	767.4	196	1321.2
7	117	483.5	127	832.5	161	1006.9	147	470.5	157	810.2	197	1357.6
8	118	510.5	128	879.0	131	1034.7	148	496.8	158	855.5	198	1395.0
9	119	539.0	129	928.1	162	1063.2	149	524.6	159	903.2	199	1433.4
0	110	330.5	120	569.1	189	1092.4	140	321.7	150	553.9	190	1122.5

To determine the tone frequencies or reed codes associated with a given monitor, proceed as follows:

a. Locate the first digit of the monitor code in the first column of Table 1, General Coding Plan.
b. In Column 2 and 3 of Table 1, find the reed group numbers for Tone A and Tone B that correspond to the first digit of the monitor code.
c. Locate the second digit of the monitor code in the first column of Table, Tone Groups.
d. Locate the reed group number for A in Table 2 (determined in Step b). The reed number and frequency are indicated for Tone A under the reed group.
e. Locate the third digit of the monitor code in the first column of Table 2. This is the tone number for Tone B.
f. Locate the reed group number for Tone B in Table 2 (determined in Step b). The reed number and frequency are indicated for B under the reed group.

4-3 EXAMPLE

Monitor 476 - According to Table 1, the first digit of this unit (4) indicates that Tone A is selected from reed Group 4 and Tone B is selected from reed Group 4. The second digit of (7) indicates that Tone 7 of Group 4 is used for Tone A and the third digit shows Tone 6 of Group 4 is used for Tone B. This unit has the following reed filters installed.


PAGING CODE 476
Determine the groups from which Tone A and Tone B are selected (Table 4)
Group 4 for Tone A, and also Group 4 for Tone B.
Tone No. 7 of Group 4 = 470.5 Hz (Table 2)
Tone No. 6 of Group 4 = 445.7 Hz (Table 2)

5-1 GENERAL

This monitor is activated by a VHF carrier, which is frequency modulated by two sequential audio tones. The FM receiver receives the carrier, extracts the audio tones and determines their frequency and sequence. If the frequency and sequence of the transmitted paging tones match the predetermined tone combination in the unit, the decoder activates the alert tone circuitry to produce an audible alert tone.

Refer to the Schematic Diagram for the following detailed circuit analysis of this monitor.

5-2 RF AMPLIFIER AND ANTENNA CIRCUIT

The signal transmitted to the monitor appears across the ferrite antenna L1. Components C11 and VC1 provide for an impedance match between the antenna and RF amplifier Q1. J1 provides a 50 ohm input to the RF amplifier for alignment purposes or for connection of an external antenna. The RF amplifier, with its high gain and low noise figure, establishes the basis receiver sensitivity.

Additional selectivity for image rejection is provided at the output of the amplifier by the tuned circuits consisting of coils L2 and L3 and associated capacitors.

5-3 FIRST OSCILLATOR AND MIXER

The high conversion circuit consists of an oscillator and a mixer. Oscillator Q3 is overdriven and produces a square-wave output rich in odd harmonics. The basic oscillator frequency is determined by crystal Y1; however, the oscillator frequency may be adjusted slightly (warped) to compensate for component aging or tolerances. Variable capacitor VC2 is the oscillator warp adjustment. This circuit is composed of L5, C34 and is tuned to the third harmonic of the basic oscillator frequency. The signal produced at the junction of L5 and C35 is injected into the base of Q2 via C21. The oscillator injection signal is then mixed with the output of the RF amplifier and a 21.4 MHz first IF is produced.

5-4 FIRST CRYSTAL FILTER

The output of the mixer is coupled to a two-pole monolithic crystal filter to obtain the IF selectivity required to reject signals on adjacent channels. This crystal filter uses the Piezo electric properties of the quartz crystal to selectivity couple a signal from the input to the output of the filter.

The selectivity attained by this device is due to the inherent high "Q" of the quartz material.

5-5 SECOND OSCILLATOR AND MIXER

The low conversion circuit consists of oscillator and mixer. The high IF signal appearing at L16 is fed to the base of Q4, where the signal is mixed with second local oscillator signal of 20.945 MHz producing a 455 KHz second I.F. signal.

5-6 455 KHZ AMPLIFIER AND DISCRIMINATOR

The output of the second mixer Q4 is applied to the 455 KHz filter FL2 to obtain a basic receiver selectivity.

The signal from this filter is applied to the second IF amplifier Q6 and integrated circuit of IC1 where the signal is amplified and limited before demodulation. The output of IC1 (Pin #5) is applied to the demodulator circuit consisting of L8, L9, CR1 and CR2 where the audio information is removed from the FM signal.

5-7 AUDIO CIRCUIT

Audio Amplifier, Decoder and Tone Squelch Control Circuits are indicated as Audio Circuit as per Figure 2.

a. Audio Amplifier Circuit

The audio amplifier circuit consists of Pre Amp Q7, Pre Amp Q8, Speech Gate (A) Q9, Speech Gate (B) Q10, and Audio PA Q11 and Q12.

In the reset condition, Speech Gate (A) and Speech Gate (B) are in the OFF position and the unit is squelched. After the allocated paging tones are received, Speech Gates (A) and (B) become open and the discriminator output is amplified by Pre Amp Q7 and Q8, passes Speech Gate (A) and (B), and is finally amplified by Audio PA Q11 and Q12 to produce sound in the speaker.

b. Decoder Circuit

The decoder circuit consists of Tone Amp Q13, Reed Filter FL4 and FL5, and Decoder IC2 and IC3.

The Paging Tones are amplified by Tone Amp Q13 and then selected by Filter FL4 (Tone A) and FL5 (Tone B). Selected Tones A and B are routed into the detector circuit of Decoder IC2. Tone A produces a high level at the output of IC2 followed by a low level when Tone A is finished. When this change (high to low) happens, IC3 sets IC2 to accept Tone B detection. When Tone B arrives, the output of IC2 changes to a high level. This high level becomes 1) power supply for Alert Tone of IC3 and 2) Signal A of the Tone Squelch Control Circuit.

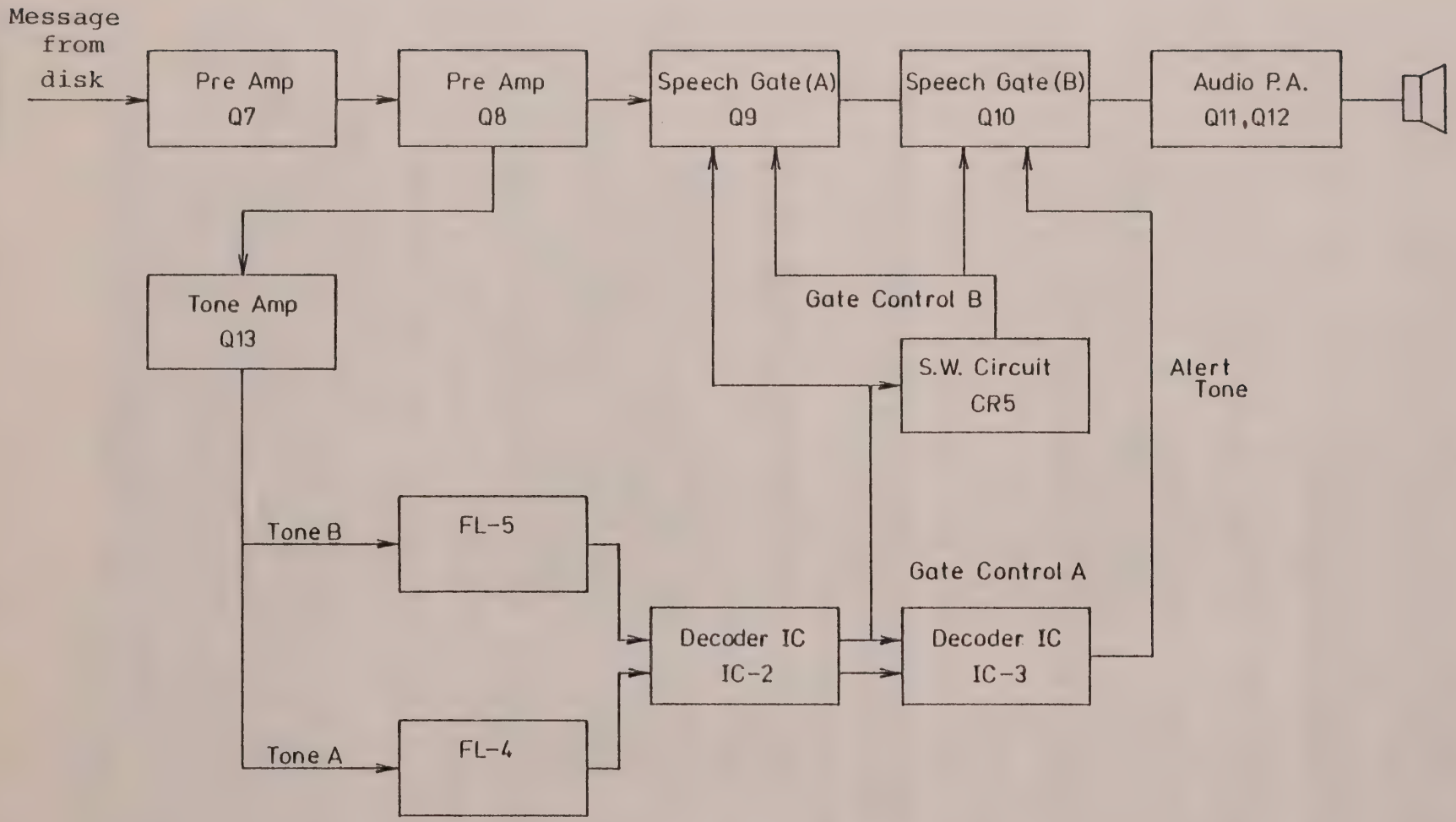


FIGURE 2 - AUDIO CIRCUIT BLOCK DIAGRAM

c. Tone Squelch Control Circuit

The tone squelch control circuit consists of SW Circuit CR5. This circuit controls Speech Gates (A) and (B) and hence the Audio Output from the speaker.

When Gate Control Signal (A) becomes high level, the output from CR5, which is the Gate Control Signal, (B) becomes high level and supplies power to the collector of Q9 and to the base of Q10 which turns Q9/Off and Q10/On. When the Alert Tone enters the base of Q10, it is amplified by Audio PA Q11 and Q12 and produces alert tone sound from the speaker. Of course the Paging Tones are not heard because Speech Gate (A) Q9 is OFF.

When Tone (B) is completed and Gate Control Signal (A) becomes low level, Q9 changes from OFF to ON. Then the audio from the discriminator passes Speech Gates (A) and (B) and is amplified by Q11 and Q12 to produce sounds from the speaker.

SECTION 6 - MAINTENANCE

6-1 EQUIPMENT REQUIRED

a. Circuit Tester
b. RF VTVM
c. Standard Signal Generator

20- 22 MHz
132-174 MHz
400-500 KHz

d. Frequency Meter
e. AF Oscillator
f. Oscilloscope
g. DC Volt and Current Meter
h. Two-Tone Encoder (For Decoder Test)

6-2 BATTERY VOLTAGE CHECK

First check battery as follows: Turn the volume control on and listen to the receiver noise with no signal present. Then turn the volume control fully clockwise to produce full speaker output. In this case, if the battery's electrical potential drops below 3.3V, it is in a discharged condition: Ni-Cad Battery needs recharge or Mercury Battery needs replacement.

6-3 OVERALL PERFORMANCE TEST

If the battery is normal, proceed with a check of performance tests, referring to the measurement circuit of Figure 1.

a. 20dB Quieting Sensitivity Check

This is the simplest measurement method for obtaining receiver sensitivity. As per Figure 1, connect SSG and LM (RMS AC voltmeter) to ANT JACK and SP JACK. Turn the volume switch clockwise. A click noise is heard (because the decoder responds to the power supply transmit), and then rushing noise will be heard immediately. Turn the volume knob clockwise until the level meter indicates -3dBm.

Next, set SSG RF Signal on the monitor receiving frequency and increase signal level until the monitor noise output becomes quiet. When the level meter indicates -23dBm, the SSG output level is the 20dBm quieting sensitivity level. The SSG should indicate below 0.5uV when the quieting is 20dB.

b. Audio Output

Using same measurement circuit as for 20dB quieting sensitivity, check set SSG for 1 KHz/3 KHz deviation and 30uV RF output. When level meter indicates 90mW (8 ohm load impedance) audio output, confirm distortion is below 10%.

Next, turn volume knob fully clockwise and confirm audio output is +2.7dB (8 ohm load impedance). If above is satisfied, audio is normal.

c. Alert Test

Connect Two-Tone Encoder to external modulation connector of SSG and set SSG output at +30uV.

Set Tone A and Tone B from Two-Tone Encoder to standard modulation (3 KHz deviation). Transmit Tone A for 1 sec and Tone B for 3 sec. Then the alert tone (about 3 KHz) should be heard from the speaker until transmission of Tone B is finished. After the alert tone disappears, receiver should be in quieting condition. Then change SSG to inter-modulation; then 1 KHz tone will be heard. Decrease SSG output above steps and confirm it works below 0.15uV. Finally, push the reset button; the 1 KHz alert tone or white noise should disappear and the unit should become quiet.

6-4 TROUBLE SHOOTING

a. Take PCB out of the case.

b. Voltage check.

c. AF Amplifier

Input AF signal (1 KHz) from each collector terminal of Q9, Q8 and Q7 and confirm speaker output. Observe output power wave form while confirming distortion.

d. 2nd IF & Discriminator check.

Connect 455 KHz SSG with primary stage of L6 and input modulation of 1 KHz/3 KHz deviation. Then adjust L9 for maximum AF noise while observing level meter; but don't touch L6 and L7 because they are hardened by wax when factory adjusted.

e. 2nd L.O./1st L.O.

Measure 2nd L.O. frequency at emitter of Q5 with frequency counter. Regarding 2st L.O., connect frequency counter through a 10pf cap to the base of Q2. If frequency is not normal, adjust by trimmer VC2.

f. Sensitivity

Connect SSG output to J1. Re-adjust L2, L3 and L5 if 20dB quieting is over 0.5uV output from SSG.

g. Decoder check

If the decoder does not work, perform the following tests:

1. Input AF signal from a base of Q13 and confirm Q13 collector has output.
2. Input AF signal (-10dBm) to the base of Q13 and then confirm output power -21dBm minimum at Pin #4 of IC2.
3. Input frequency signal of FL5 from Q13 base as above and confirm DC level increase at Pin 7 of IC2.
4. Turn off signal from the above Item 3 status and confirm a single 60 msec pulse at IC4 within 200-500 msec.
5. Input FL5, FL4 frequency signal at a time with Item 2 condition and confirm DC level is high at terminal 2 when FL5 signal turns off one sec later.

   At this time, confirm the 3 KHz alert tone output at IC3, Pin #7.

6-5 DC AND AC VOLTAGE TABLE

MEASUREMENT POINT	DC VOLTAGE (V)
Emitter of Q1	0
Base	0.7
Collector	1.2
Base of Q2	2.3
Collector	2.8
Emitter	1.6
Base of Q3	2.1
Collector	3.6
Emitter	1.4
Base of Q4	0.7
Collector	2.4
Base of Q5	1.6
Collector	3.4
Emitter	0.9
Base of Q6	0.7
Collector	3.5
1 pin IC1	0.5
2	0.5
6	2.4
5	0.8
Base of Q7	0.6
Collector	0.8
Base of Q8	
Collector	2.8
Emitter	

MEASUREMENT POINT		DC VOLTAGE (V)
Base	of Q9	0.8
Collector		1.5
Emitter		0.2
Base	of Q11	1.9
Collector		3.75
Emitter		1.8
Base	of Q12	1.9
Emitter		1.8
Base	of Q13	0.7
Collector		1.7
Emitter		0.1
6 pin	of IC2	0.6
3		0.3
8		3.7
2		3.7
9		3.7
7		0.07
1		0.06
4		0.8
1 pin	of IC3	0.06
3		1.4
5		0.6
4		0
6		3.7
7		0.6
2		0.8

Measurement condition:	Power supply voltage	3.75V DC
	VOL setting	speaker output level
	Maximum	-3dBm white noise

SECTION 7 - PARTS LIST

7-1 UNITS WITH GROUP CALL DECODER

REFERENCE NUMBER	DESCRIPTION	PART NUMBER
CAPACITORS		
C11	Ceramic 22pf	11-539-2
C12, 16, 20, 22, 23, 34, 40, 52, 53, 60, 62, 63, 73	Ceramic, 1000pf	611-100-0
C13, 15	Ceramic 7pf	11-532-2
C14, 35	Ceramic 0.5pf	611-164-0
C21	Ceramic 4pf	11-529-2
C24, 64, 151	Tantalum 4.7uf	14-065-0
C30	Ceramic 5pf	11-554-2
C31	Ceramic 33pf	11-565-2
C32	Ceramic 27pf	11-564-2
C33	Ceramic 12pf	11-536-2
C36	Ceramic 10pf	11-535-2
C41	Ceramic 5pf	11-506-2
C50	Ceramic 56pf	11-568-2
C51	Ceramic 39pf	11-566-2
C61, 65, 66, 67, 75, 80, 91, 102, 103, 111, 130, 143	Tantalum 3.3uf	14-063-1
C70, 71	Ceramic 120pf	11-572-2
C72	Ceramic 82pf	11-570-2
C74	Tantalum 0.1uf	14-059-2
C90, 92	Tantalum 0.047uf	14-057-1
C100, 133, 134,140, 152	Tantalum 15uf	14-067-0
C101	Mylar 5600pf	13-041-0
C104	Mylar 0.01uf	13-039-0
C105	Mylar 2200pf	13-040-0
C106, 110	Electric 100uf	14-084-0
C120	Tantalum 0.33uf	14-102-0
C131, 141	Tantalum 33uf	14-068-0
C132	Tantalum 0.47uf	14-069-1
C142, 150	Tantalum 10uf	14-066-0
VC1	Variable 1.5-4pf	20-062-0
VC2	Variable 5-35pf	20-064-1
RESISTORS		
R11	47k ohm 1/8W PT	4-618-0
R12	680 ohm 1/8W PT	4-574-0
R20, 50, 51, 70, 72, 135, 136	47K ohm 1/8W	4-473-0
R21	1.5K ohm 1/8W	4-437-0
R30, 32, 61, 75, 94, 120	1K ohm 1/8W	4-433-0
R31	100K ohm 1/8W	4-481-0
R40, 53, 90, 103, 105	10K ohm 1/8W	4-457-0
R41, 130, 133, 134	220K ohm 1/8W	4-489-0
R42, 52, 60, 64, 66, 132	2.2K ohm 1/8W	4-441-0
R62	330K ohm 1/8W	4-493-0
R63	100 ohm 1/8W	4-409-0

REFERENCE NUMBER	DESCRIPTION	PART NUMBER
R65, 93, 101	3.3K ohm 1/8W	4-445-0
R71, 73, 100	33K ohm 1/8W	4-469-0
R74, 80, 91	150K ohm 1/8W	4-485-0
R76, 81	4.7K ohm 1/8W	4-449-0
R92, 104, 137	150 ohm 1/8W	4-413-0
R102	68K ohm 1/8W	4-477-0
R110	10 ohm 1/8W	4-385-0
VR1	Variable Resistor 30K ohm w/switch	8-040-0
VR2, VR3	Semi-Fixed Resistor 50K ohm	10-070-1
INDUCTORS		
L1	Bar Antenna	70-008-0
L2, 3	Transformer T234-2	42-020-0
L4	Coil Z881NZ	43-149-0
L5, 11	Transformer T234-3	42-021-0
L6	Transformer T279-4	42-024-0
L7, 8	Transformer T235-2	42-023-0
L9	Transformer T235-1	42-022-0
L10	Choke AF K68	46-048-0
L12	Coil Z883NZ	43-122-0
SEMICONDUCTORS		
Q1, 2	Transistor 2CS2549	31-134-0
Q3, 4, 5, 6	Transistor 2SC2668	31-129-0
Q7, 8, 9, 13	Transistor 2SC2458	31-128-1
Q10, 11	Transistor 2SC2710	31-130-1
Q12	Transistor 2SA1150	30-052-1
CR1, 2, 7, 8, 9, 10, 11, 13	Diode IS2075K	34-034-0
CR3, 4, 6, 12	Diode IN60P	34-003-0
CR5	Diode 02AM-1	36-001-0
INTEGRATED CIRCUITS		
IC1	IF Amp IC-1	39-035-1
IC2	Decoder 1 IC-2	39-036-1
IC3	Decoder 2 IC-3	39-037-1
IC4	Group Call IC-4	39-042-1
IC5	Noise SQ IC-12	39-067-1
OTHERS		
FL1	Crystal Filter 21J1B	25-229-0
FL2	Ceramic Filter CFW455E	25-230-0
FL3	Ceramic Filter BFU455K2	25-196-0

REFERENCE NUMBER	DESCRIPTION	PART NUMBER
FL4, 5	Tone Reed	
J1	Jack, Miniature Phone W/Switch	60-088-1
LSP1	Speaker 8 ohm 0.2W	54-020-0
S2	Momentary SPST	51-032-0
S3	Slide Switch	49-026-0
Y1	Crystal (spec. freq.)	
Y2	Crystal 20.945 MHz	24-027-0
	Screw, Rear Case	79-090-0
	Cover, Front	74-418-0
	Cover, Rear	74-417-0
	Cover, Battery	74-419-0
	Bezel	74-416-0
	Card Holder Up	74-222-0
	Card Holder Down	74-223-0
	Knob, Volume	74-422-0
	Knob, Push Switch	74-421-0
	Plate, Name	89-622-0
	Plate, FCC	89-621-0

7-2 UNITS MANUFACTURED BEFORE NOVEMBER 1980 WITHOUT GROUP CALL DECODER

REFERENCE NUMBER	DESCRIPTION	PART NUMBER
CAPACITORS		
C11	Ceramic 22pf	11-358-1
C12, 16, 20, 22, 23, 35, 40, 52, 53, 60, 62, 63, 73	Ceramic 1000pf	611-100-0
C13, 15	Ceramic 7pf	11-350-0
C14, 37	Ceramic 0.5pf	11-410-0
C21	Ceramic 4pf	11-344-0
C24, 64, 152	Tantalum 4.7uf	14-065-0
C32	Ceramic 33pf	11-386-0
C33	Ceramic 27pf	11-385-0
C34, 36	Ceramic 10pf	11-354-0
C38	Ceramic 5pf	11-372-0
C41	Ceramic 5pf	11-321-0
C50	Ceramic 56pf	11-389-1
C51	Ceramic 39pf	11-387-0
C61, 65, 66, 67, 75, 81, 91, 102, 110, 121, 130	Tantalum 3.3uf	14-063-1
C70, 71	Ceramic 120pf	11-367-1
C72	Ceramic 100pf	11-366-1
C74	Tantalum 0.1uf	14-059-2
C90, 92, 93	Tantalum 0.047uf	14-057-1
C100, 133, 134 153	Tantalum 15uf	14-067-0
C101, 123	Electric 100uf	14-030-0
C111	Tantalum 0.01uf	14-095-0
C120	Ceramic 5600pf	11-188-0
C122	Ceramic 0.01uf	11-187-0
C131	Tantalum 33uf	14-068-0
VC1	Variable 1.5-4pf	20-062-0
VC2	Variable 5-35pf	20-064-0

REFERENCE NUMBER	DESCRIPTION	PART NUMBER
RESISTORS		
R11, 20, 50, 51 70, 72, 80, 135, 136	47K ohm 1/8 Watt	3-185-0
R12	680 ohm 1/8 Watt	3-163-0
R21	1.5K ohm 1/8 Watt	3-167-0
R30, 32, 61, 95	1K 1/8 Watt	3-165-0
R31	100K 1/8 Watt	3-189-0
R40, 53, 100, 103	10K 1/8 Watt	3-177-0
R41, 133, 134	220K 1/8 Watt	3-193-0
R42, 52, 60, 64 66	2.2K 1/8 Watt	3-169-0
R62	330K 1/8 Watt	3-195-0
R63	100 ohm 1/8 Watt	3-153-0
R65, 93, 101	3.3K 1/8 Watt	3-171-0
R71, 73	33K 1/8 Watt	3-183-0
R74, 102, 105	68K 1/8 Watt	3-187-0
R75, 81, 94, 132	4.7K 1/8 Watt	3-173-0
R82	470 ohm 1/8 watt	3-161-0
R90	15K 1/8 Watt	3-179-0
R91, 130	150K 1/8 Watt	3-191-0
R92	330 ohm 1/8 Watt	3-159-0
R104, 137	150 Ohm 1/8 Watt	3-155-0
R106	10 ohm 1/8 Watt	3-141-0
R131	220 ohm 1/8 Watt	3-157-0
VR1	Variable Resistor 30K ohm w/switch	8-040-0
VR2	Semi-Fixed Resistor 50K ohm	10-070-0
INDUCTORS		
L1	Bar antenna	70-008-0
L2, 3	Transformer RF 150 MHz	42-020-0
L4	Coil RF 40 MHz	43-122-0
L5, 11	Transformer RF 130 MHz	42-021-0

REFERENCE NUMBER	DESCRIPTION	PART NUMBER
L6	Transformer IF 21.4 MHz	42-024-0
L7, 8	Transformer IF 455 MHz	42-023-0
L9	Transformer IF 455 MHz	42-022-0
L10	Choke, AF 340mH	46-048-0
L12	Choke, RF	43-149-0
SEMICONDUCTORS		
Q1, 2	Transistor 2SC1260	31-095-0
Q3	Transistor 2SC1906	31-099-0
Q4, 5, 6	Transistor 2SC535B	31-104-0
Q7, 8, 9, 13	Transistor 2SC460	31-012-0
Q10, 11	Transistor 2SD355C	30-030-0
Q12	Transistor 2SB525	30-016-0
CR1, 2, 7, 8, 9, 10, 11	Diode 1S275K	34-034-0
CR3, 4, 6	Diode 1N34A	34-001-0
CR5	Diode 02AM-1	36-001-0
INTEGRATED CIRCUITS		
IC1	IF Amp. (IFA)	39-035-0
IC2	Decoder 1	39-036-0
IC3	Decoder 2	39-037-0
IC4	Noise SQ	39-067-0
MISCELLANEOUS		
FL1	Crystal Filter 21.4 MHz	25-047-0
FL2, 3	Ceramic Filter 455 KHz	25-046-0
FL4, 5	Tone Reed (Specified Freq)	MA-413
FL7	Ceramic Filter	25-196-0

REFERENCE NUMBER	DESCRIPTION	PART NUMBER
J1	Jack, Miniature Phone w/switch	60-088-0
LSP1	Speaker 8 ohms 0.2W	54-020-0
S1	Momentary SPST	51-032-0
S3	Slide switch	49-026-0
Y1	Crystal (Spec. freq)	30-412-9
Y2	Crystal, 20.945 MHz	24-022-1
	Screw, Rear Case	79-090-0
	Cover, Front	74-418-0
	Cover, Rear	74-417-0
	Cover, Battery	74-419-0
	Bezel	74-416-0
	Card Holder UP	74-222-0
	Card Holder Down	74-223-0
	Knob, Volume	74-422-0
	Knob, Push Switch	74-421-0
	Plate, Name	89-622-0
	Plate, FCC	89-621-0
	Nicad Battery	MA-413

SECTION 8 - PARTS PLACEMENT

Figure 3 Units with Group Call Decoder

Figure 4 Units manufactured before November 1980 without Group Call Decoder

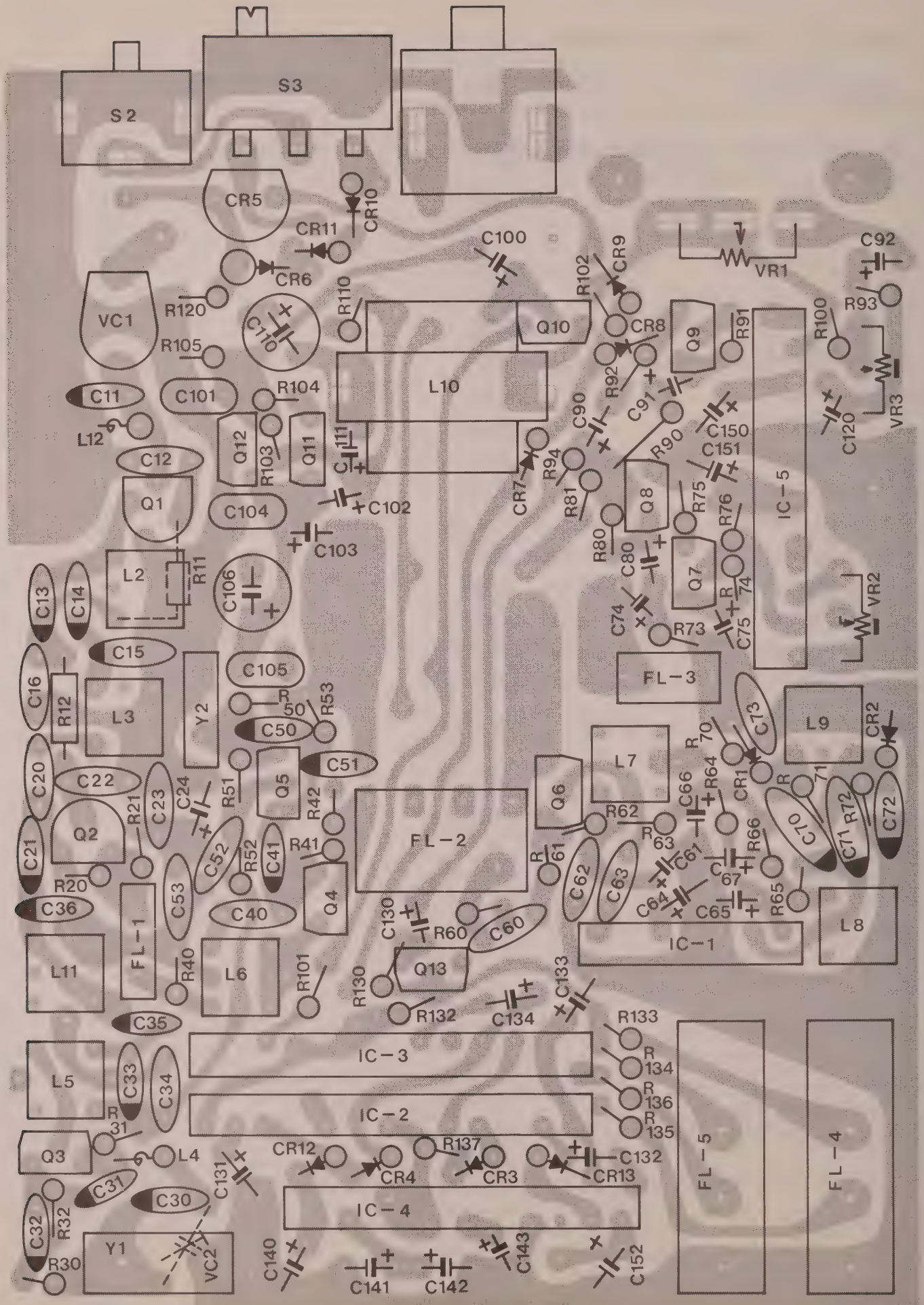

S2
S3
CR5
CR10
CR11
CR6
C100
R102
CR9
VR1
C92
R93
VC1
R120
C110
R110
Q10
CR8
Q9
R91
R100
R105
L10
R92
C97
C150
C120
VR3
C11
C101
R104
L12
Q12
R103
Q11
C111
C90
C151
C12
Q1
C104
C102
CR7
R94
R81
Q8
R75
R76
IC-5
C103
R80
C80
Q7
R74
C74
C75
R73
VR2
L2
R11
C106
C13
C14
C15
FL-3
C16
R12
L3
Y2
C105
R50
R53
C50
C73
L9
CR2
C20
C22
C51
L7
R70
C66
R64
CR1
R71
C21
Q2
R21
C23
C24
R51
Q5
R42
Q6
R62
C72
C52
R52
C41
R41
FL-2
R61
R63
C10
C71
R72
R20
C62
C63
C61
R66
C67
C36
C53
C40
Q4
C64
C65
R65
L8
C130
R60
C60
IC-1
L11
FL-1
R40
L6
R101
R130
Q13
R132
C134
C133
C35
R133
IC-3
R134
L5
C33
C34
R136
IC-2
R135
R31
Q3
L4
CR12
CR4
R137
CR3
CR13
C132
C131
FL-5
FL-4
C31
C30
IC-4
C32
R32
Y1
VC2
R30
C140
C141
C142
C143
C152

FIG. 3

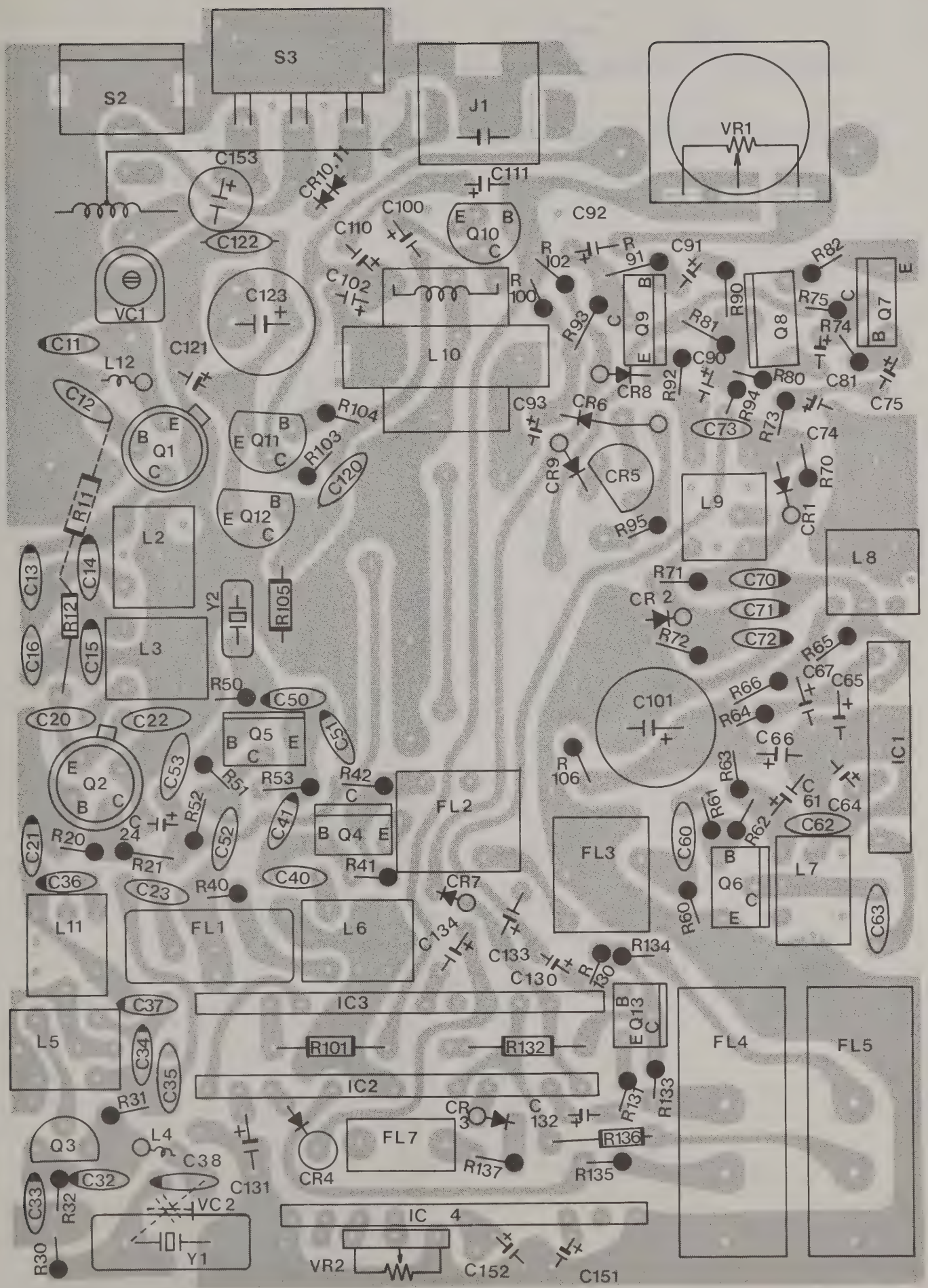
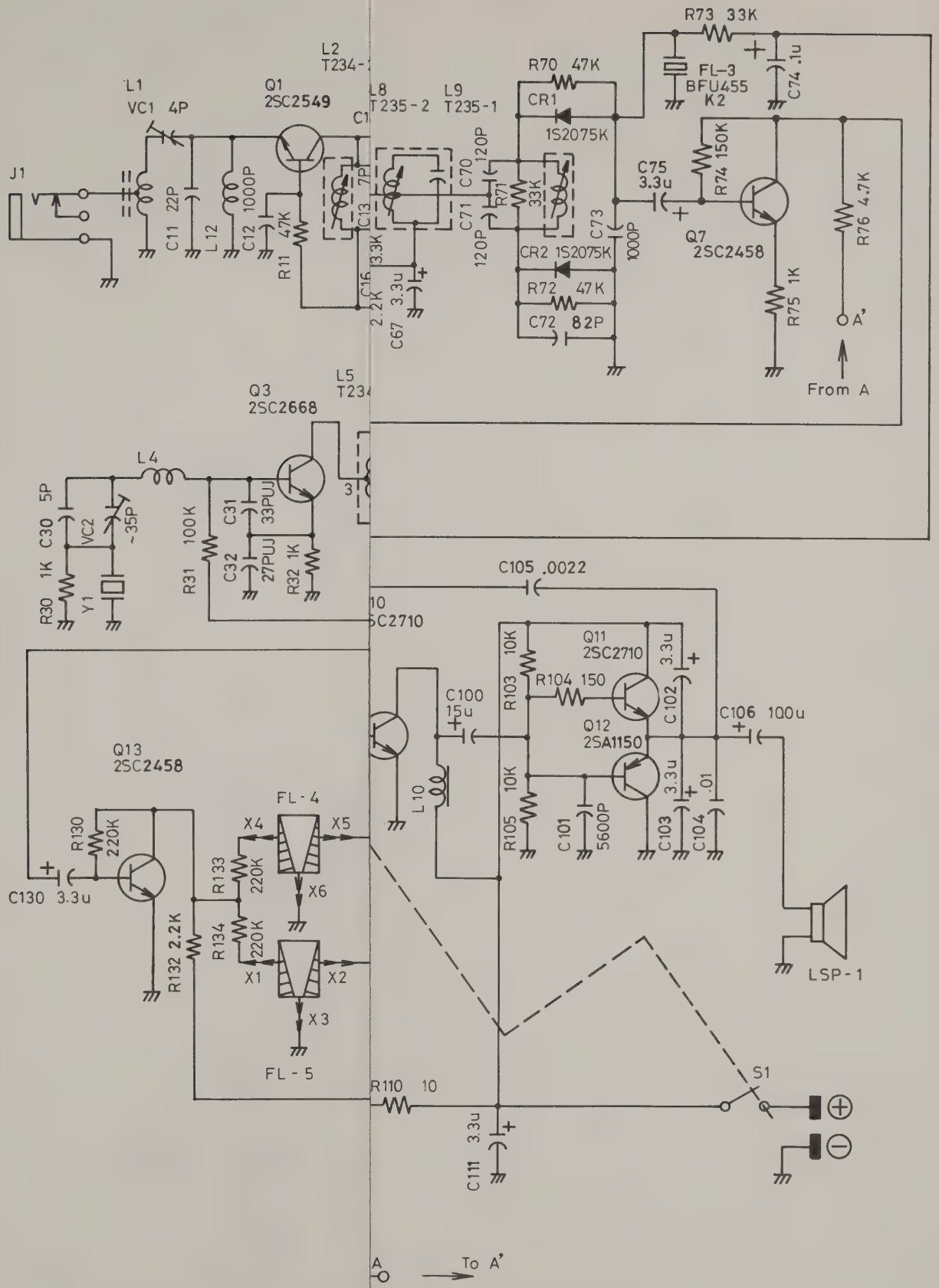

S3
S2
J1
VR1
C153
CR10.11
C111
C122
C100
C110
Q10
C92
C102
R102
R91
C91
R82
VC1
C123
R100
R93
Q9
R90
Q8
R75
Q7
R74
C11
C121
L10
R81
C90
R80
C81
C75
L12
C12
R104
C93
CR6
CR8
R92
R94
C73
R73
C74
Q1
Q11
R103
C120
CR9
CR5
R70
CR1
R11
L2
Q12
L9
R95
L8
C13
C14
R71
C70
Y2
R105
CR 2
C71
R12
C16
C15
L3
R72
C72
R65
R50
C50
C101
R66
C67
C65
C20
C22
Q5
C51
R64
C66
IC1
C53
R51
R53
R42
R106
R63
Q2
FL2
C61
C64
R52
C24
R61
R62
C62
C21
R20
R21
C52
C41
Q4
FL3
C60
C36
R41
Q6
C23
R40
C40
CR7
L7
C63
L11
FL1
L6
C134
C133
R134
R60
C130
R130
C37
IC3
Q13
L5
R101
R132
FL4
FL5
C34
C35
IC2
R31
R131
R133
CR
3
C
132
Q3
L4
C38
FL7
R136
CR4
R137
R135
C32
C131
C33
R32
VC2
IC 4
R30
Y1
VR2
C152
C151

FIG. 4

SECTION 9 - SCHEMATIC DIAGRAMS

Figure 5 Units with Group Call Decoder

Figure 6 Units manufactured before November 1980 without Group Call Decoder



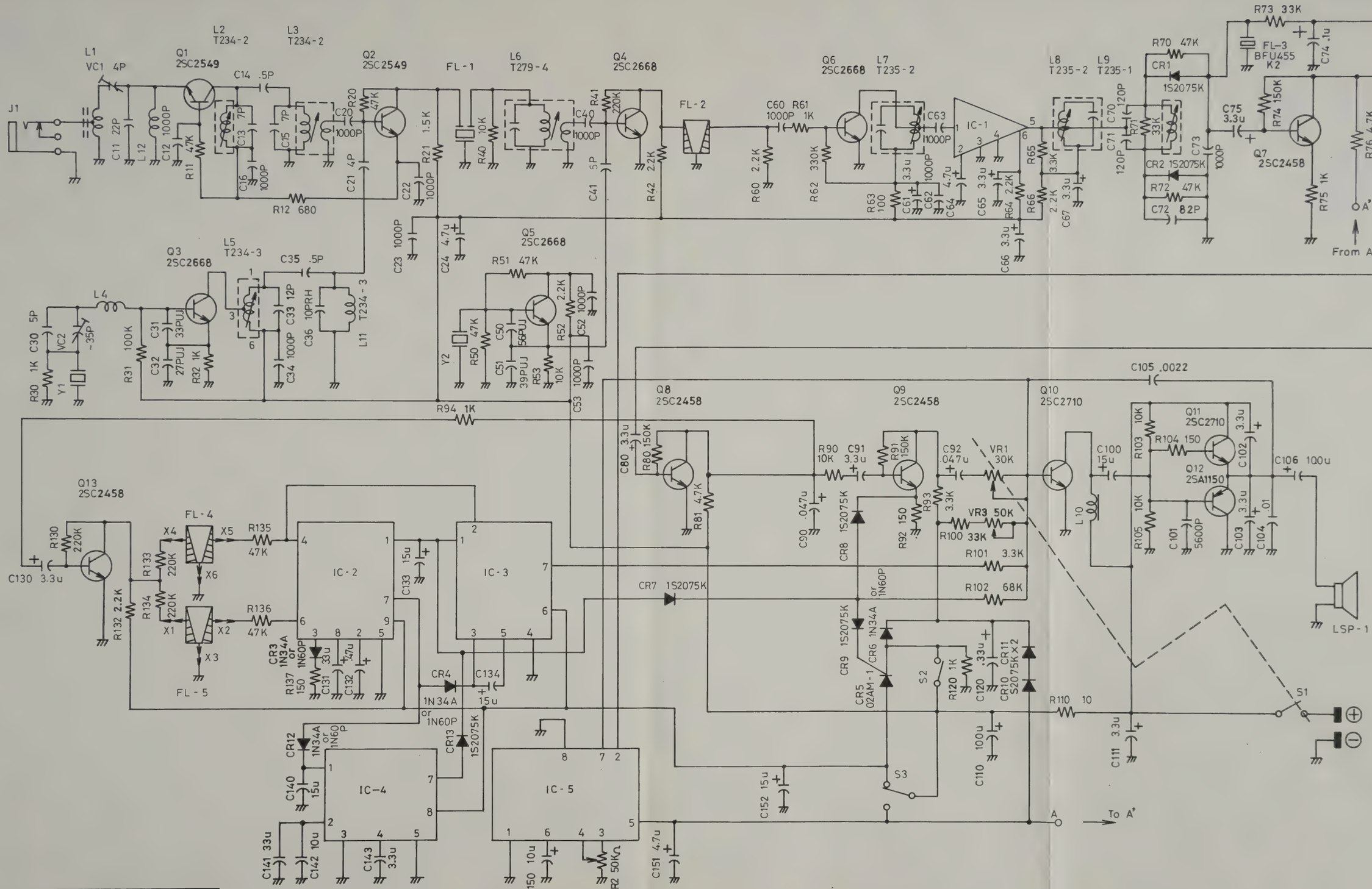
PARTS NO / BAND	LOW	HI
C13	7PF	5PF
C15	7PF	6PF
C36	10PF	7PF

FIG. 5

SECTION 9 - SCHEMATIC DIAGRAMS

Figure 5 Units with Group Call Decoder

Figure 6 Units manufactured before November 1980 without Group Call Decoder



PARTS NO \ BAND	LOW	HI
C13	7PF	5PF
C15	7PF	6PF
C36	10PF	7PF

PARTS NO \ Y2	TOYO	NDK
C51	39PF	18PF
C41	5PF	22PF

FIG. 5

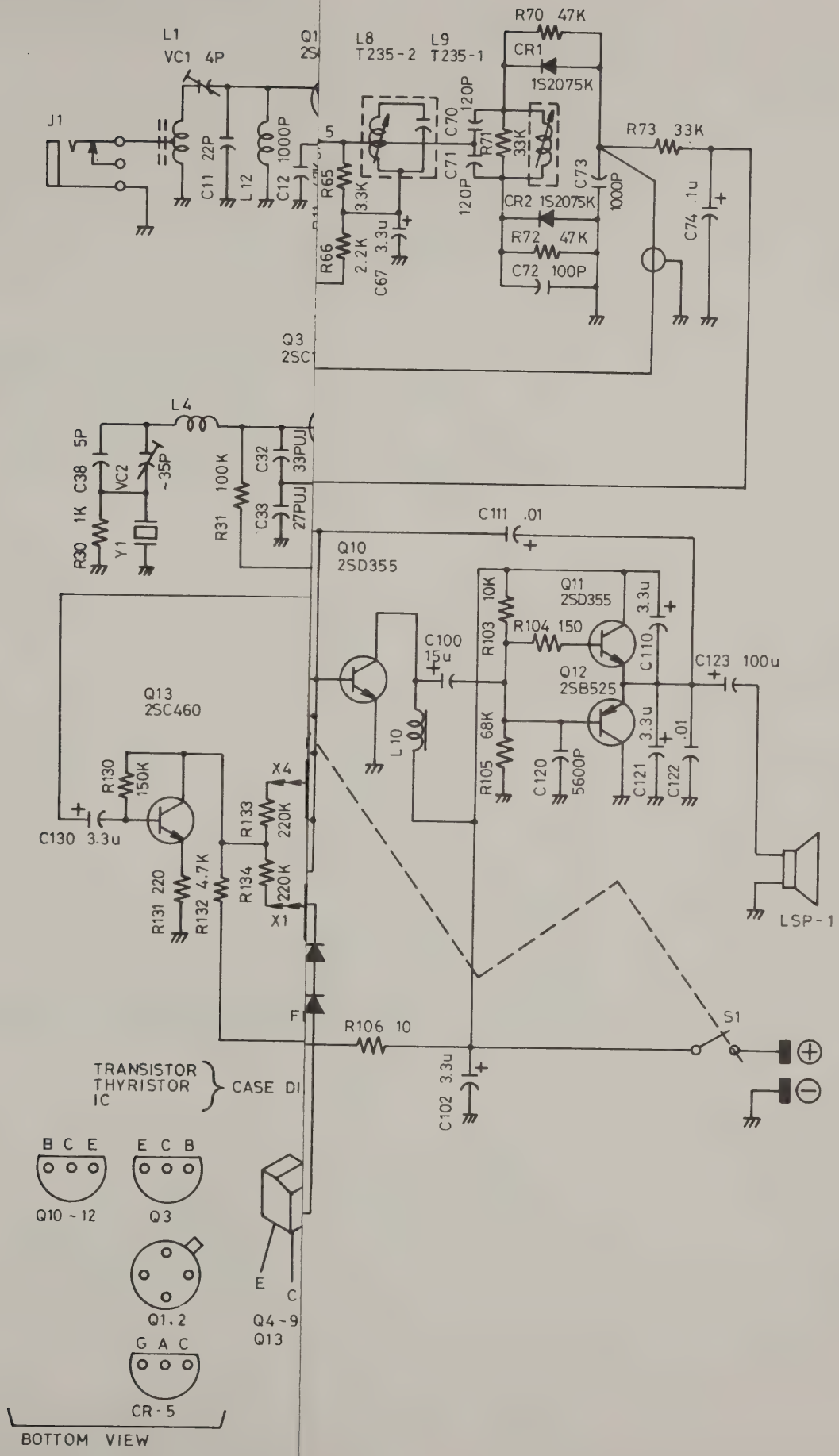
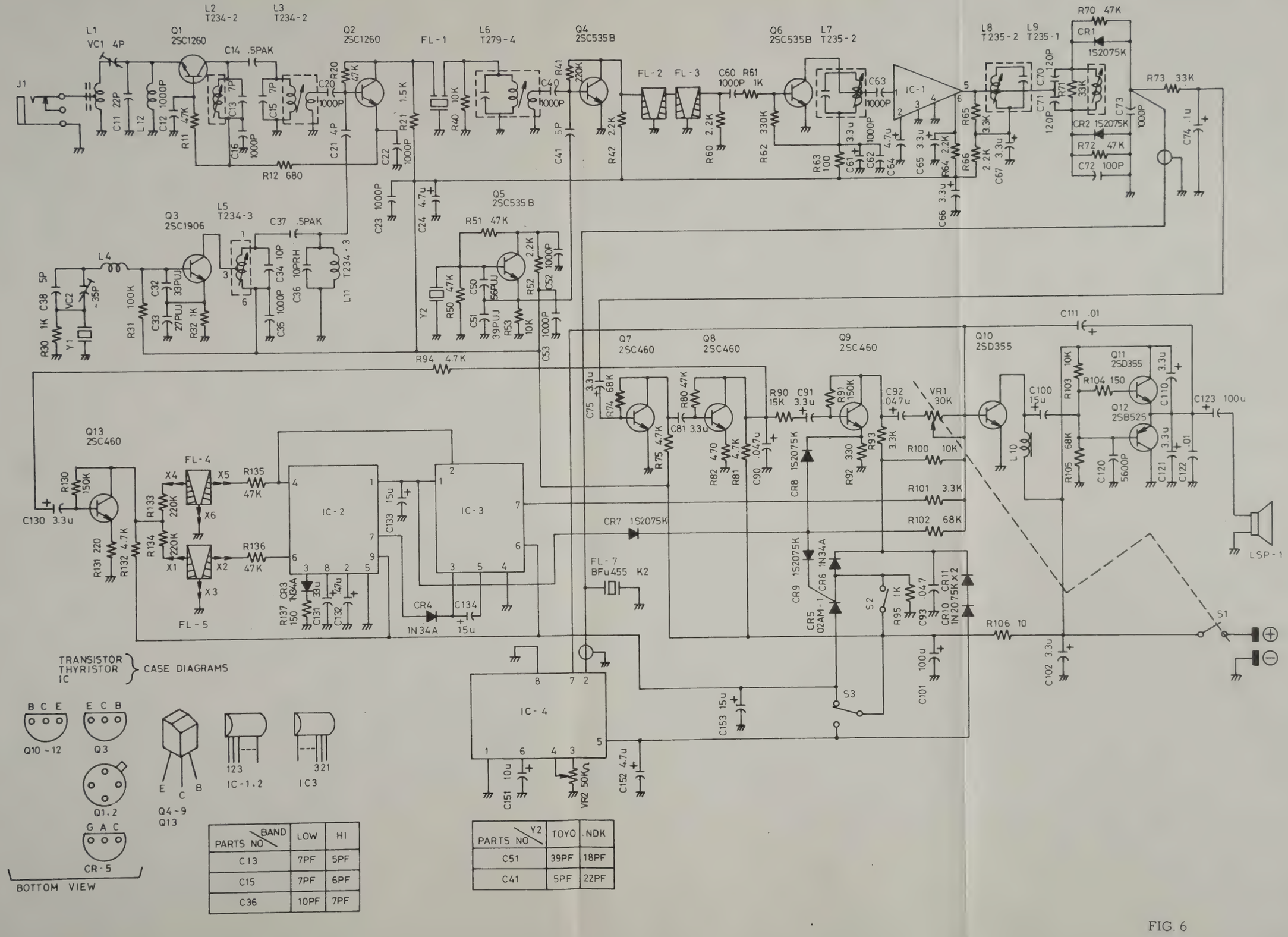

L1
VC1 4P
J1
C11 22P
L12
C12 1000P
L8
T235-2
L9
T235-1
R70 47K
CR1
1S2075K
C70 120P
R71 33K
C71 120P
CR2 1S2075K
R72 47K
C72 100P
C73 1000P
R73 33K
C74 .1u
R65 3.3K
R66 2.2K
C67 3.3u
Q3
2SC1
L4
C38 5P
VC2 -35P
R30 1K
Y1
R31 100K
C32 33PUJ
C33 27PUJ
C111 .01
Q10
2SD355
Q11
2SD355
R103 10K
R104 150
C110 3.3u
C100 15u
Q12
2SB525
C123 100u
Q13
2SC460
L10
R105 68K
C120 5600P
C121 3.3u
C122 .01
R130 150K
C130 3.3u
R131 220
R132 4.7K
R133 220K
R134 220K
X4
X1
F
R106 10
S1
C102 3.3u
LSP-1
TRANSISTOR
THYRISTOR
IC
CASE DI
B C E
Q10 ~ 12
E C B
Q3
Q1.2
G A C
CR-5
BOTTOM VIEW
E
C
Q4~9
Q13

FIG. 6



PARTS NO \ BAND	LOW	HI
C13	7PF	5PF
C15	7PF	6PF
C36	10PF	7PF

PARTS NO \ Y2	TOYO	NDK
C51	39PF	18PF
C41	5PF	22PF

FIG. 6

Regency COMMUNICATIONS INC.

SERVICE MANUAL

ON CALL ALERT RECEIVER

MODEL MCA-611

1227 S. PATRICK DRIVE
SATELLITE BEACH FLA

0300-4126-800

PRINTED IN U.S.A.
1-80

TABLE OF CONTENTS

SECTION 1 GENERAL INFORMATION

1-1 DESCRIPTION

The MCA 611 is a two channel crystal controlled FM Receiver. The channel frequencies may be selected from any of three public service communications bands; Low VHF band (30-50) MHz, High VHF band (146-174) MHz and UHF band (450-512) MHz. The bands are jumper pin selectable and the two channels need not be in the same band.

The primary use of this receiver is as a tone alert device; it can also be used to monitor uncoded traffic on your alert channel at the user's discretion. In the alert mode the receiver is held in the squelched condition until its special coded signal is received.

There are two different two-tone codes that will activate each receiver. The codes are made up of three tones A, B and C. The first tone called A for convenience must be the lead tone of the two-tone sequence, the second tone can be either B or C but not both. This will allow all radios to have a common code as well as an individual code. (A,B) can be a common code and individual call codes can be (A,C), (A,D), (A,E), (A,F), etc.

The number of possible combinations of codes can be greatly increased by the installation of an MA 301 option. This essentially doubles the number of tones that can be received and allows for two first tones, or A tones which can be either the same or different depending on the owner's requirements.

The MCA 611 utilizes silicon transistors for reliability as well as ten integrated circuits. The tone decoder is a digital device unlike older models that used reeds. In addition, both a crystal first I.F. filter and a ceramic second I.F. filter are employed. This provides superior performance in areas where there are many closely-spaced channels.

In addition, this radio features both carrier controlled reset and timer controlled reset. Either one or the other may be used to reset the digital filter and return the radio to a squelched condition. The timer will run from 30 sec to 3 minutes and the other system resets and squelches the radio when the carrier stops. In order for the carrier reset to work, the radio must be squelched.

An external speaker jack and connectors for an AC or DC igniter have also been included on the back panel. The user has the option of either a pulsed or unpulsed igniter (jumper pin selectable).

1-2 SPECIFICATIONS

See page 2

1-3 EQUIPMENT SUPPLIED

a. Receiver Unit
b. DC Power Cord
c. Telescopic Antenna
d. Carrying Handle
e. Owners' Instruction Manual
f. Warranty Card
g. AC Power Cord
h. Antenna clip
i. Mobile Mounting Bracket

1-4 EQUIPMENT NOT SUPPLIED WITH UNIT (ACCESSORIES)

a. Antenna Splitter - MA-5
b. Battery - MA-181
c. DC Igniter - MA-24
d. Remote Speaker - MA-108

1-2 SPECIFICATIONS

GENERAL

Channels	2
Operating temperature	-30°C to 60°C
Operating duty cycle	8 hr 10% alert
Size	6 1/2"W x 10 3/4"L x 2 5/8"H 16.5 x 27.3 x 6.7 cm
Weight	3.12 lb/1.42 kg
Voltage Req	117 vac, 12-17 VDC. Batt. 10.8 VDC
Current drain	@ 13.8 VDC
Receiver squelch	55mA
Receiver max audio	145mA
Antenna	50 ohm

RECEIVER

Sensitivity	20dB QUIETING/12dB SINAD	
LL 30- 39 MHz	.5	/.4
LH 39- 50 MHz	.5	/.4
HL 146-160 MHz	.5	/.4
HH 160-170 MHz	.5	/.4
UL 450-470 MHz	.55	/.45
UH 475-500 MHz	.55	/.45
Audio sq. sensitivity -		
Threshold	.3 µv UHF	
Tight	.34µv UHF	
Adjacent channel	20dB QUIETING/12dB SINAD	
Low VHF 30- 50 MHz	60	/45
High VHF 146-170 MHz	65	/65
UHF 450-500 MHz	45	/58
Spurious rejection (except primary image)	50dB	
Intermodulation attenuation	20dB QUIETING/12dB SINAD	
Low VHF 30- 50 MHz	55	/45
High VHF 146-170 MHz	55	/55
UHF 450-500 MHz	45	/46
MAB	8.5 KHz	
Freq stab temp	.0006% VHF	
Freq stab volt	.001% VHF	
Audio response	EIA +2/-8 6dB/octave de-emphasis	
Audio out power (max)	.5W	
Squelch blocking	Meets EIA specs	
Receiver attack time	150ms (max)	
Receiver sq. closing	250ms (max)	
Hum & noise ratio	38dB unsquelched, 50 squelched	
Undesired conducted (AC)	-85dB m (max)	
Undesired conducted (RF)	-94dB m (max)	
Undesired radiated	FCC	

DECODER

Frequency range	208 Hz - 3906 Hz (continuously adjustable)
Audio input impedance	greater than 10K ohm
6dB bandwidth	20 Hz

Inputs -

A0 audio imput	.2 - 1vrms
D12 RST input (MCA-611 only)	9V max.
K5 Microphone hang-up	0v (enable) open (reset)

Outputs -

D0 MSG lamp driver (MICRO-COM 2-way only)	30ma sink
D11 MSG latch Q output (MCA-611 only)	13ma source
K7 sq. control (MICRO-COM 2-way only)	15ma source

Sensitivity (decoder with audio)	12dB sinad 100% detect
	6dB sinad 75% detect

1-5 INSTALLATION

Mobile 12 VDC Installation:

The MCA 611 is designed for mobile installation in any vehicle that has a 12 VDC negative ground system. The red lead with the fuseholder must be connected to the positive terminal side of the battery. In the event that the battery is remotely located, it may be necessary to install additional wires or pick up +V from some other location in the vehicle's electrical system. Ground may be picked up from the optional mounting hardware but a hard wired ground to the phillips head screw on the back of the chassis is preferred.

Remove the antenna by rotating it counter clockwise. Install an MA-5 antenna splitter so the MCA 611 can share the vehicle's built-in antenna with the existing radio. Mount the bracket MA-63 to any convenient location and screw the radio into position with the two knurled knobs.

Battery Installation:

Remove the antenna by rotating it counter clockwise; remove the two knurled knobs and pull the case off. Place the connector end of the battery (MA-181) gently between the spring retainers and slide it forward until it makes good contact. Then attach the battery retaining bracket on the back of the battery and "snug" it forward until the battery is held firmly; tighten the bracket screw.

Crystal Installation:

The following Regency Part Number crystals are used:

Low VHF:	301-542
High VHF:	301-532
UHF:	301-603

Crystal socket X201 (XTL socket furthest from speaker) corresponds to the "normal" position of the front panel frequency select switch. X201's band select pin is on the anode of CR209. The band is selected by putting the other end of the jumper pin on one of the following pins, depending on the required frequency.

LL 30- 39MHz	HH 160-170MHz
LH 39- 50MHz	UL 450-470MHz
HL 146-160MHz	UH 475-500MHz

X202's jumper pin is connected to the anode of CR210 and corresponds to the "alternate" frequency.

After the crystals are installed, it will be necessary to tune it up in accordance with the instructions in the service manual.

Igniter Installation:

Two igniter drivers are provided on the main board; a pulsed drive and an unpulsed drive. The later is already wired to the bottom lug of the three terminal connector on the back panel of the radio. This makes the radio immediately compatible with the MA-24 Igniter Option.

If you require an ON-OFF feature for your igniter, simply remove the female jumper connector from Q213 and put it on the collector pin of Q212.

1-6 OPERATION

Volume Control:

This control varies the audio output level for the internal speaker. It also varies the level of audio present at the external speaker connection. Moving the control up increases the Volume level.

Squelch Control:

The squelch only works when the radio is in the monitor mode. It eliminates background noise in the absence of a signal. Full squelch is all the way down.

Alert Monitor Switch:

In the alert mode only the properly coded signal can open the squelch. In the monitor mode any traffic on the selected frequency can be monitored.

Frequency Switch:

This selects either F1 or F2.

Duty Switch:

Used only with an MA-301 option, otherwise it is left in the "Normal" position. This switch would allow an appropriately equipped radio to decode either AB and AC or ZE and ZF. (An internal connection will allow the radio to decode AB, AC AND ZE, ZF regardless of the duty switch position.

Alert and Ex. Pwr. Light:

Steady light indicates AC Power ON.
No light indicates radio is on battery.
Slow Flashing - Low battery.
Fast Flashing - a signal has been received.

Rear Panel:

For convenience of mobile operation, we have included two +V connectors on the back of the radio; one for the vehicle's battery and one to power the igniter option MA-24. The bottom connector is for the igniter drive. In addition, there is an external speaker jack which allows for a remotely located speaker, MA-108, as well as an external antenna jack to go with the MA-5 y coupler antenna.

1-7 CRYSTAL SPECIFICATIONS

Due to the numerous frequencies or channels involved, the crystals are not normally installed by the factory, but by the seller or owner of the unit. The Regency part numbers are listed in Section 1-5. When ordering from another manufacturer, the following information should be provided:

1. Crystal frequency, determined as follows:

   Low Band: Crystal frequency = channel frequency +10.7 MHz

   Example:
   Crystal frequency=39.5 MHz = 50.2 MHz - 10.7 MHz

   High Band: Crystal frequency = $\frac{\text{channel frequency -10.7 MHz}}{3}$

   Example:
   Crystal frequency=$\frac{155.55 \text{ MHz} -10.7 \text{ MHz}}{3} = \frac{144.85 \text{ MHz}}{3}$=

   48.2833 MHz

   UHF Band; Crystal frequency = $\frac{\text{channel frequency -10.7MHz}}{9}$

   Example:
   Crystal frequency - $\frac{458.0 \text{ MHz} -10.7 \text{ MHz}}{9} = \frac{447.30 \text{ MHz}}{9}$=

   49.70000 MHz

2. Frequency tolerance of 0.001% on High Band and UHF Band, 0.002% on Low Band.
3. UHF Band - 3rd overtone, load capacity of 18pf; drive level of 2 milliwatts.
4. VHF Bands - 3rd overtone, series resonance minus 450 Hz.
5. Maximum impedance of 35 ohms.
6. Holder is an HC-25/U with pin leads (plug-in type).

SECTION 2 CIRCUIT DESCRIPTION

2-1 CRYSTAL SELECT CIRCUIT

The two crystals X201 and X202 are selected by jumpering pins on the anodes of CR209 and CR210 to the appropriate pin corresponding to the frequency divisions on the device specification page. When a band is selected, bias is applied to the appropriate front end by causing the associated diodes to conduct through the frequency selector switch SW401 to ground.

When the UH Pin is selected, ground is applied to R229 and R224 thus biasing the UHF amp and mixer. In all cases except the LH select case, the low band varactors are held close to ground by CR223, 222 and 221. When the UL Pin is selected the tuning varactors CR205 and CR206 have a variable bias through R243.

By selecting any other band the AFC which is only needed for the UHF is disabled by diodes CR215 and CR218.

Selecting HH applies ground to the High VHF RF amp Q203 and mixer Q204 bias resistors. Varactors CR203 and CR204 are at +8 volts. Selecting HL grounds R250 providing variable bias to those diodes, (CR203 and CR204).

Selecting LH grounds R203 and R216 and puts 8 volts on the cathodes of CR201 and CR202. Selecting LL grounds CR201 and CR202.

2-2 RF FRONT END

Q201 is the Low Band VHF amplifier. Varactor tuning is used in the input and output circuits to determine whether the circuits are tuned to the upper or lower segment of the low band. The RF signal from Q201 is coupled to the input of the low band mixer Q202.

Q203 is the High Band VHF RF amplifier. The input circuit is double-tuned. Varactor tuning is used to tune both parts of the double-tuned circuits to determine whether the circuits are tuned to the upper or lower segments of the high band. The RF output signal from Q203 is coupled to the input of the high band mixer Q204.

Q205 is the VHF RF amplifier. Varactor tuning is used in the input and output to determine whether the circuits are tuned to the upper or lower segments of the UHF band.

2-3 OSCILLATOR/MULTIPLIER

Q208 is the crystal controlled local oscillator. The fundamental frequency of the crystal is taken from the emitter circuit for low band VHF injection. The third harmonic of the crystal frequency is taken from the collector circuit for high band injection. When operating on UHF, the third harmonic of the crystal frequency at the collector of Q208 is coupled to a frequency tripler Q207 which multiplies the frequency by three for UHF injection. Q207 is turned on only for UHF operation. The fundamental frequency of the crystal is multiplied by nine for UHF injection.

2-4 I.F.

The first I.F. frequency 10.7 MHz, from any one of the mixers, is fed through XF201 (a monolithic crystal filter) to the input of IC201 (Pin 18). Between Pins 18 and 3 is the second I.F. mixer circuit. Crystal X203 is used to generate the second L.O. frequency (10.245 MHz) used to mix with the 10.7 MHz I.F. to produce the second I.F. frequency 455 KHz. The 455 KHz signal at Pin 3 of IC201 is fed through CF201, a narrow band ceramic filter centered at 455 KHz, to Pin 5 of IC201. Between Pins 5 and 10 of IC201, there are amplifiers, limiters and a quadrature detector circuit. The adjustable quadrature coil is connected between Pins 8 and 4 of IC201.

2-5 AUDIO

The demodulated audio from Pin 10 is de-emphasized by R262 and C265 and capacitively coupled through the squelch switch Q209 to the audio amplifier IC202. The squelch amp and squelch switch are inside IC201. A logical low on Pin 14 (audio being received) sets Pin 16 High thereby providing bias to Q209 and allowing audio to pass into IC202. A High on Pin 14 of IC201 (noise) produces a low on Pin 16, IC201, grounding the bias current on Q209 and squelching the audio. The noise level at which the squelch switch engages is controlled by R403, the squelch control.

2-6 TWO-TONE SEQUENTIAL DECODER

Audio enters at A0 and is limited by CR301 and CR302. The audio is then filtered by a high-Q digital filter and the amplified output appears at Pin 1 of IC304. The voltage has to be 4 vpp in order to trigger the detector in IC303. The audio is further amplified by IC304 and the output Pin 7, IC304 is fed to the harmonic detector of IC303 (Pin 5). The harmonic detector will stop the decoder from detecting any harmonics of the tone to be decoded.

When the correct tone is present, the detector output, after being delayed, fires a one-shot. The one shot time constant is set by R316, R317 and C313 and can be varied by R317 to fit the user's particular inter-tone timing.

The digital filter itself is an 8-pole filter. The filtered output frequency is determined from the clock frequency. The relationship is $f_{clock}/8 = f_{filter}$.

The clocks are gated from either Pin 1 of IC301 or IC302, depending on whether it is the first or second tone to be decoded. The clock is selected by the oscillator switch output of IC303.

Tone A (the first to be decoded) is selected by the adjustment of R301. Similarly Tones B and C are set by grounding manually Pin 7, IC302 via JO301 and setting the second tone and then ungrounding it to set the third using the trimming potentiometers R320 and R318, respectively.

When Tone A is received, the one-shot is fired. Oscillator switch 1 is grounded and oscillator switch 2 goes high (.5v). IC302 is now the clock source and IC301 is used to alternate between the two clocks for Tones B and C, by alternately grounding and ungrounding Pin 7 of IC302 gating first the clocks for Tone B and the Tone C into IC303. The period of oscillation on Pin 7 of IC302 is 200ms.

When the second tone has been received (Tone B or Tone C) before the one-shot has timed out, the latch is set and D11 is grounded. This causes Pin 14 of IC201 to go low turning off that the squelch switch, which turns on Q209 thus unsquelching the radio.

2-7 LAMP LOGIC AND IGNITER DRIVES

When a signal is decoded and Pin D11 goes low, it sets the latch Pin 6, IC206C "Low", Pin 4, IC206B "High", thereby turning on both the high rate "ALERT" flasher consisting of IC205D and IC206E and the two igniter drives. The user may select, via a jumper pin, which drive he requires either pulsed or unpulsed. The low on Pin 6, IC206C disables both the AC on logic consisting of IC204A and the low battery indicator consisting of IC204B.

CI206F and IC205C are the slow light logic circuits for the low battery indicator. All of the logic elements activate the LED on the front panel by forward biasing Q211 into conduction.

2-8 DECODER RESET

Resetting the decoder is accomplished by driving Pin 13 of IC303 to less than 1V for at least 25ms. This may be done in three ways; the carrier controlled reset, the time out reset and front panel switch SW405. The front panel switch is the only way to reset both the signal light and the decoder.

A jumper is installed at the factory from JU-D15 to JU-D13. This allows the decoder to reset in the absence of a carrier so that it can be ready to decode the next message. The flashing light indicating that the radio has already received a message must be reset manually via SW405.

To monitor the radio traffic for 30 sec to 3 minutes after a message has been received, switch the jumper from JU-D15 to JU-D14 and set the RC timing network R293 for the time you desire. When the circuit has timed out, Q214 will stop conducting making the base of Q304 go high causing it to conduct and thereby resetting the decoder. Again the flashing light will remain on until manually reset to let the user know a message has been received.

SECTION 3

ALIGNMENT PROCEDURE

APPLICATION	
NEXT ASSY	USED ON

REVISIONS			
REV	DESCRIPTION	DATE	APPROVED
A	R-204	11-12-79	BAP

REV A | SH | DWG. NO. TP-14-254

FINAL TEST PROCEDURE

MCA 611 ON CALL ALERT RECEIVER

A. R.F. Alignment Procedure

I. Test Set-Up

A. Equipment

1. F.M. Signal Generator
2. AC VTVM capable of measuring 455 KHz
3. DC Voltmeter

Note: If a radio has two crystals in the same band, a frequency midway between them should be used for the tune-up procedure so that the RF amp will be broad tuned. The anode of CR209 must be jumpered to the spare pin on the anode of CR210 and then jumpered to the correct band pin (LL, UH, HH, etc.). If the radio uses both bands of a given preselector, tune the upper range to a middle frequency first, then switch to the lower range and check the mid band sensitivity there. In the case of UHF adjust R243 to achieve rated sensitivity and for high VHF adjust R250 to achieve the lower band sensitivity. For the low VHF bands tune for the best combined sensitivity. Some compromise in sensitivity may be necessary between any two bands. If only one frequency is being used for a given preselector then tune up the radio for best sensitivity on that particular frequency.

B. Radio Preset

1. Connect DC power supply to DC power connection, top pin of 3-pin connector on the back of the radio. (The DC power supply can be substituted by using the radio's own AC supply; 117V 60Hz.)

2. Set radio controls as follows:
   a. Volume - comfortable listening level
   b. Squelch - upper most slide position
   c. Alert/monitor switch - in monitor position

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES. TOLERANCES ARE FRACT. ± DEC .XX± .XXX± ANG. ±	APPROVALS	DATE
	DRAWN	
	CHECKED	
	DFTG. SUPV.	
MATERIAL	ENGR. BAP	11/12/79
FINISH		
DO NOT SCALE DRWG.		

Regency® COMMUNICATIONS INC.
SATELLITE BEACH, FLORIDA 32937

FINAL TEST PROCEDURE
MCA 611 ON CALL ALERT RECEIVER

SIZE	PART NUMBER	REV.
A	TP-14-254	A

SCALE | SHEET 1 OF 8

d. Duty Switch - in normal position
e. Frequency switch - on frequency to be aligned
f. On/Off switch - in ON position

3. Install crystals
   a. Put crystal in socket X201 (XTL socket farthest from speaker). X201 corresponds to "normal" freq.
   b. Run band select jumper from anode of CR209 to the correct range select pin.
   c. X202 corresponds to the two band select pins farthest from speaker.

LL	30-39 MHz	HH	160-170 MHz
LH	39-50 MHz	UL	450-470 MHz
HL	146-160 MHz	UH	475-500 MHz

C. Quadrature Alignment

1. With no signal applied, put the DC Voltmeter's probe on Pin 10 of IC201 (A0 Pin) and adjust L216 until the voltage is 3.5 volts.

D. I.F. Alignment

1. Connect the FM Signal Generator to the antenna input jack. Accurately set the frequency to the center of the channel being used for alignment. Modulate the Signal Generator with 1,000 Hz, 3K KHz deviation.
2. Connect the AC Voltmeter to Pin 5 of IC201 (foil side of board).
3. Set AC Voltmeter to the 100mv scale.
4. Adjust the Signal Generator output until the AC Voltmeter reading is mid-range.
5. Adjust L208 for maximum AC Voltmeter reading. Re-adjust the Signal Generator's output to maintain voltmeter reading near mid-range.

Note: If the RF segments refuse to tune up or will not allow full rated sensitivity, check the position of the band select pin with respect to the frequency of the crystal and the band select jumper.

With the frequency select switch SW401 in the normal position crystal X201 (farthest from speaker) and the pin closest to speaker are "turned on".

E. Low VHF Segment (30-50 MHz)

1. Connect AC Voltmeter to Pin 5, IC201.
2. Set AC Voltmeter to the 100 millivolt scale.
3. Make sure band select pins are set up as per Note.
4. Set the Signal Generator accurately to the frequency of the channel being used for alignment. Connect the generator's output to the antenna input jack. Adjust Signal Generator's output until AC Voltmeter reading is mid-range.
5. Adjust L201 and L206 for maximum AC Voltmeter reading. Re-adjust Signal Generator's output to maintain voltmeter

reading near mid-range. Repeat adjustments until no further improvements can be made.

F. High VHF Segment (146-170 MHz)

1. Connect AC Voltmeter to Pin 5, IC201.
2. Set AC Voltmeter to the 100 millivolt scale.
3. Make sure the band select pins are set up as per Note.
4. Set the Signal Generator accurately to the frequency being used for alignment. Connect generator's output to antenna input jack. Adjust Signal Generator's output until AC Voltmeter reading is mid-range.
5. Adjust L203 and L205 for maximum AC Voltmeter reading. Re-adjust Signal Generator's output to maintain voltmeter reading near mid-range.
6. Now adjust L209 and L211 and repeat all adjustments until no further improvement can be made.

G. UHF Segment (450-500 MHz)

1. Connect AC Voltmeter to Pin 5, IC201.
2. Set AC Voltmeter to the 100 millivolt scale.
3. Make sure the band select pins are set up as per Note.
4. Set the Signal Generator accurately to the frequency being used for alignment. Connect generator's output to antenna input jack. Adjust Signal Generator's output until AC Voltmeter reading is mid-range.
5. Adjust C226, C228 and C245 in that order for maximum AC Voltmeter reading. Re-adjust Signal Generator's output to maintain voltmeter reading near mid-range. Repeat adjustments until no further improvement can be made.

Note: If sensitivity is poor (greater than .7mv) or if sensitivity varies more than 3dB while AFC voltage is varied from 1 to 7 volts, detune L211 two turns CCW.

H. AFC Alignment

1. With the unit on a channel with a UHF crystal and no RF input, adjust L216 for a voltmeter reading of approximately 3.8 volts at the junction of R253 and R249. Its setting should be within a turn of the setting in the quadrature alignment.

B. Carrier Reset Option (See Note on Page 4)

1. Set alert/monitor switch into monitor position.
2. With no RF signal applied, adjust squelch for desired squelching action.
3. Return alert/monitor switch back to the alert position.

4. Apply enough RF signal to quiet the receiver and signal the unit with proper two-tone sequence.

5. The squelch should open allowing the listener to hear the remainder of the second tone's duration and the message lamp should flash at a high rate.

6. Turn off applied RF signal so that the radio goes into the squelched mode. The decoder is now reset and no signal other than the proper two-tone sequence will open the squelch.

7. The MSG LED should remain flashing until the reset switch is moved into the reset position.

C. Time-Out Reset Option

1. Unsolder the factory installed carrier reset jumper from JU-D15 and solder it to JU-D14 (collector of Q214).

2. Turn up RF signal enough to quiet the receiver.

3. Modulate the Signal Generator with the proper two-tone sequence.

4. The squelch should open, allowing the receiver to operate normally for a given period of time. This time period can be adjusted by varying R293. The MSG LED will be flashing at a very fast rate and will remain flashing when the decoder has been reset.

5. The MSG LED can be reset by pushing the reset switch to the right.

D. Battery Voltage Warning Adjustment
(for battery equipped models only)

1. Place a DC Voltmeter probe on test point M1 and adjust R296 for 4.0 volts. The slow flash rate alarm will trigger when the battery voltage reaches approximately 9.9 volts.

E. Igniter Drive (used with MA-24)

1. A jumper (factory installed) runs from the bottom solder lug of the three terminal connector on the rear panel to the collector of Q212.

2. To provide a pulsed output, simply pull the pin from Q213 and put it on the collector pin of Q212.

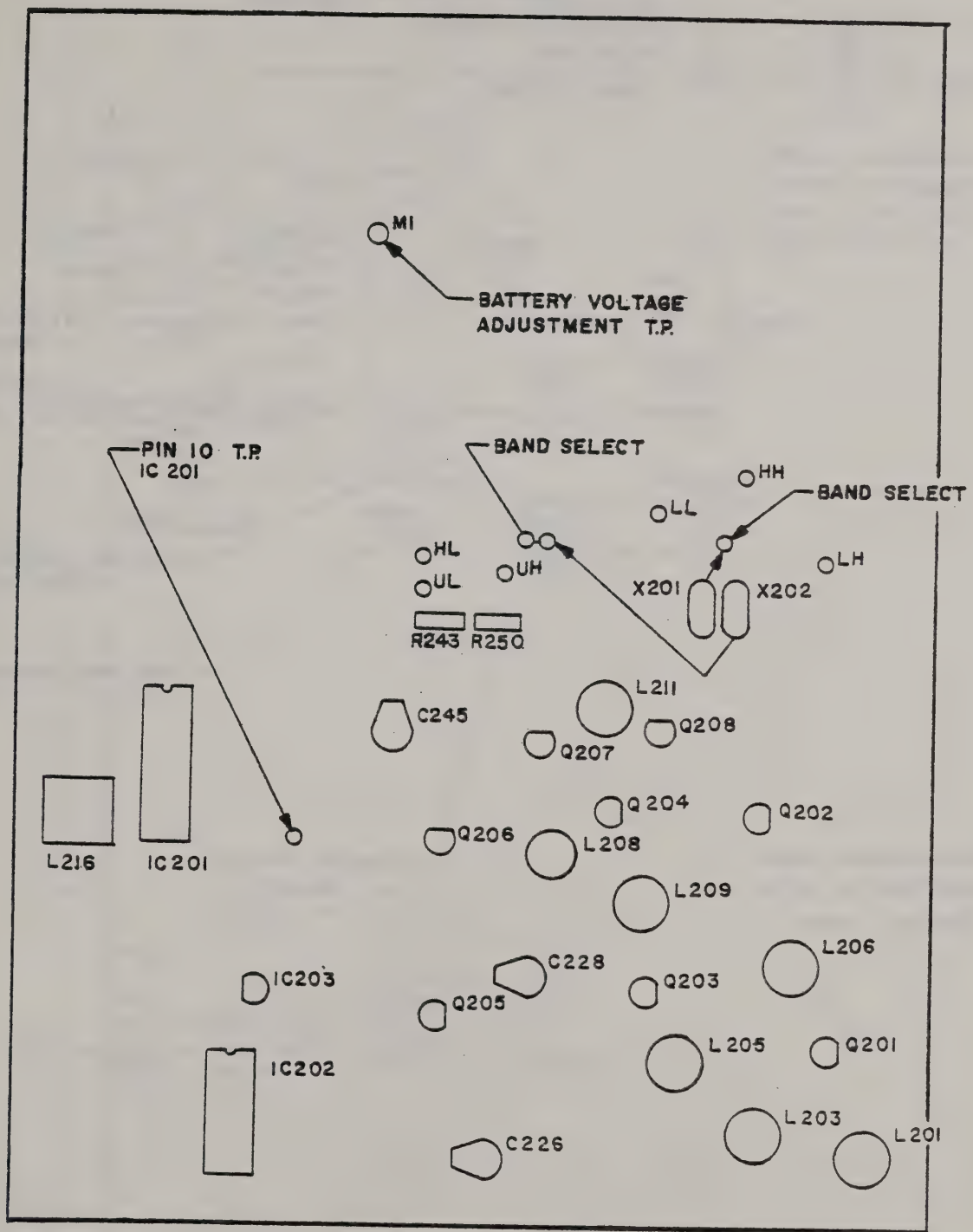
F. Acceptable Performance Limits

Sensitivity	.48μv worst case
Audio power	. 5 watt

Note: Carrier reset should not be used in areas of low signal strength, as it will decrease the radio's decode sensitivity to around 12dB sinad. If this is the case in your area, use time-out reset.

DRAWN	DATE	SIZE	PART NUMBER	REV.
APPROVED Penn A. Penn	DATE 11/12/79	A	TP-14-254	A
DO NOT SCALE DWG.		SCALE		SHEET 4

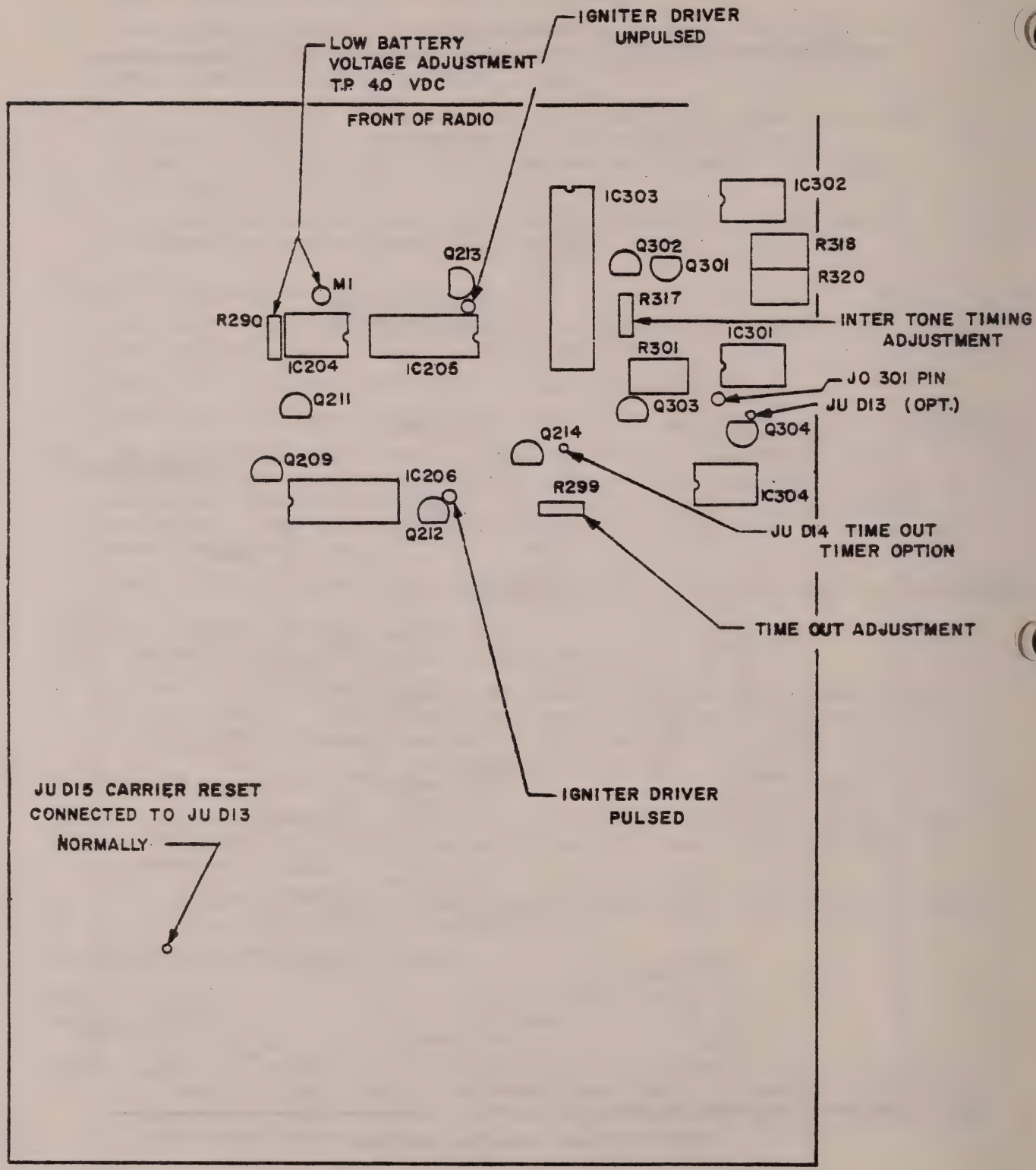
FRONT OF RADIO



RECEIVER AND CHRYSTAL SECTION

FIGURE 1

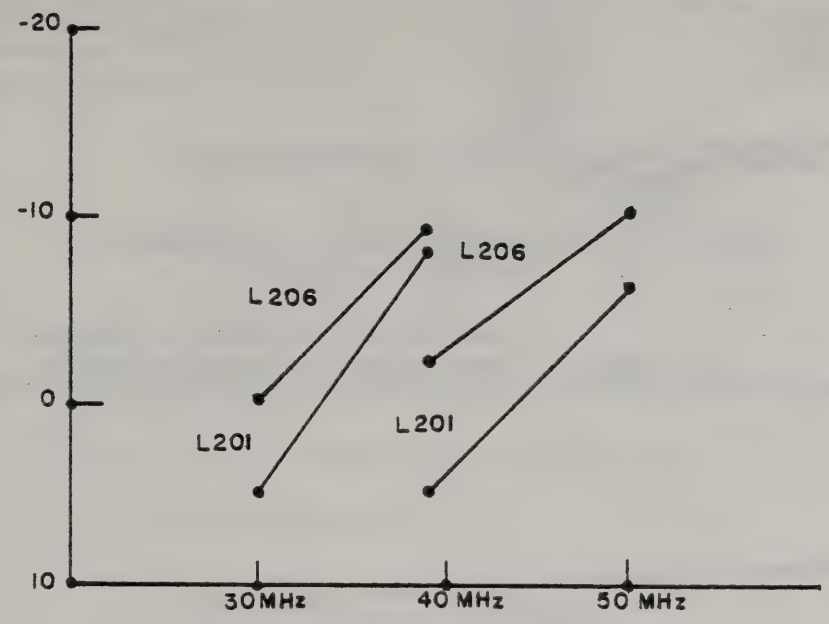
DRAWN	DATE	SIZE	PART NUMBER	REV.
APPROVED Penn C. Thomas	DATE 11/21/79	A	TP14-254	A
DO NOT SCALE DWG.		SCALE		SHEET 5



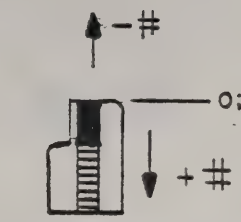
DIGITAL FILTER, IGNITER DRIVES, LOW BATT. INDICATOR,
CARRIER, TIME OUT RESET

FIGURE 2

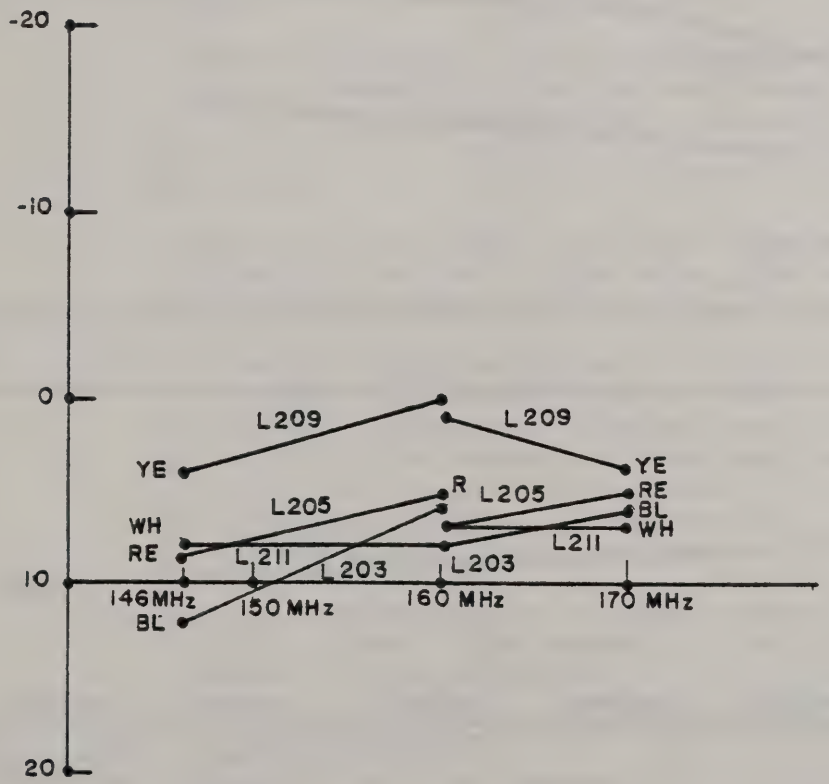
DRAWN	DATE	SIZE	PART NUMBER	REV.
APPROVED Barry C. Penner	DATE 11/1/79	A	TP14-254	A
DO NOT SCALE DWG.		SCALE		SHEET 6



LOW VHF TUNING CHART



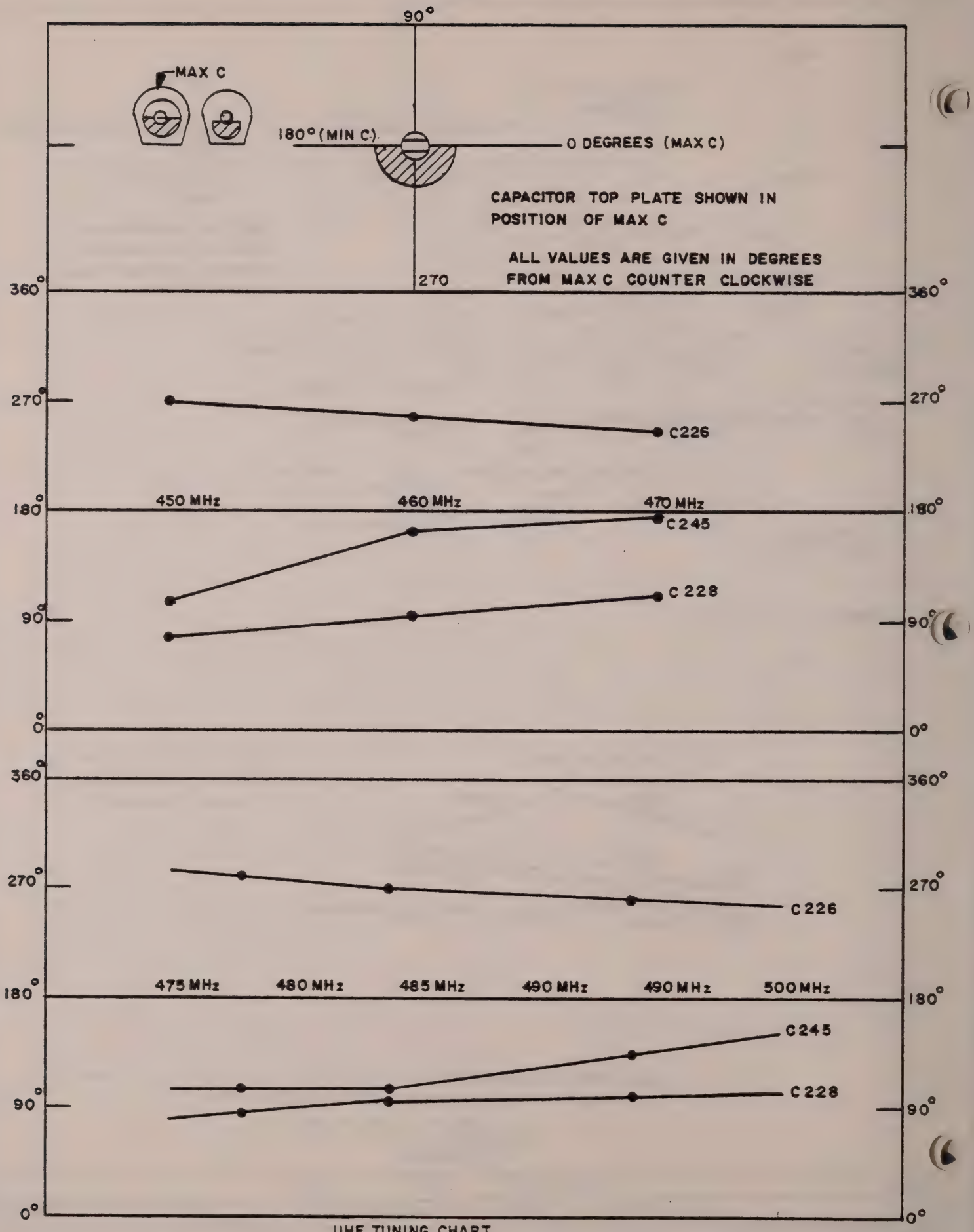
POSITIVE NUMBERS ARE COUNTED AS NUMBER OF TURNS CLOCKWISE FROM FLUSH POSITION.



HIGH VHF TUNING CHART

FIGURE 3

DRAWN	DATE	SIZE	PART NUMBER	REV.
APPROVED	DATE	A	TP14-254	A
DO NOT SCALE DWG.		SCALE		SHEET 7



UHF TUNING CHART

FIGURE 4

APPLICATION	
NEXT ASSY	USED ON

REVISIONS			
REV	DESCRIPTION	DATE	APPROVED
A	R-165	10/22/79	BAP

REV A | SH 1 | DWG. NO. TP14-219

TEST PROCEDURE

TWO-TONE SEQUENTIAL DECODER

(APPLIED TO MCA-611)

I. Sequential Tone Decoder Set-Up and Testing

A. Equipment required

1. R.F. Signal Generator
2. Two-Tone Sequential Generator
3. High input Impedance Amplifier*
4. Frequency Counter*
5. Power Supply (13-16 VDC)

*Note: In place of a high input Impedance Amplifier and a Frequency Counter, an Oscilloscope with an accurate time base may be used to set up the clock frequencies.

B. Radio Preset

1. Connect DC power supply to DC power connection, top pin of 3-pin connector on the back of the radio. (The DC power supply can be substituted by using the radio's own AC supply; 117V 60Hz.)

2. Set radio controls as follows:
   a. Volume - comfortable listening level.
   b. Squelch - upper most slide position.
   c. Alert/monitor switch - in alert position.
   d. Duty switch - in normal position.
   e. Frequency switch - in normal position.
   f. On/Off switch - in ON position.

3. Set the frequency of the RF signal generator to the normal crystal frequency (the frequency of the crystal in the socket farthest from the speaker).

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES. TOLERANCES ARE FRACT. ± DEC .XX± .XXX± ANG. ±	APPROVALS	DATE
	DRAWN	
	CHECKED	
	DFTG. SUPV.	
MATERIAL	ENGR. BAP	11-2-79
FINISH		
DO NOT SCALE DRWG.		

Regency® COMMUNICATIONS INC.
SATELLITE BEACH, FLORIDA 32937

TEST PROCEDURE -
TWO-TONE SEQUENTIAL DECODER -

SIZE	PART NUMBER	REV.
A	TP14-219	A

SCALE | SHEET 1 OF 6

4. Externally modulate the RF signal generator with the two-tone oscillator, making sure each tone is modulated at 3KHz deviation.

C. Clock adjustments

1. Using a frequency counter -
   a. Connect a high input impedance amplifier to Pin 1 of IC301 in the radio.
   b. Connect the output of the amplifier to the input of an accurate frequency counter.
   c. Adjust R301 until the counter reads eight times the value of the first tone (Tone A).
   d. Remove the end of JO301 that connects with Pin 1 of IC301 and let that end hang free.
   e. Disconnect the probe of the amplifier going to Pin 1 of IC301 and connect it to Pin 1 of IC302.
   f. Adjust R318 until a frequency of eight times tone frequency B is read on the frequency counter.
   g. Ground the end of JO301 leading to Pin 7 of IC302.
   h. Adjust R320 until eight times the frequency of Tone C is read on the frequency counter.
   i. Replace JO301 on the pin.

2. Using an oscilloscope -
   a. Connect probe of oscilloscope to Pin 1 of IC301. Set vertical sensitivity to .1v per division.
   b. Adjust R302 so that the period of the oscillation displayed on the oscilloscope is as follows:

$$t_{oscA} = 1/(8 \times f_A), \text{ where } f_A \text{ is the frequency of Tone A}$$

   c. Put in enough signal to quiet the receiver and modulate the signal generator with just Tone A. The oscilloscope will now be switching between a high and a low frequency oscillation.

   d. Now connect the oscilloscope to Pin 1 of IC302. You will observe two different oscillator frequencies being switched at about 100ms rate.

   e. One oscillation period will vary with the adjustment of R318. Adjust this period to -

$$t_{oscB} = 1/(8 \times f_B), \text{ where } f_B \text{ is the frequency of Tone B}$$

   f. The other oscillation period is adjusted by R320. Adjust R320 for a period to -

$$T_{oscC} = 1/(8 \times f_C), \text{ where } f_C \text{ is the frequency of Tone C}$$

D. Adjusting the Inter-Tone Timing

1. Modulate RF signal generator with Tone A.
2. Connect oscilloscope to Pin 17 of IC303.
3. Adjust R317 for this period.

One shot period - period of 1st tone + period delay + period 2nd tone.

4. Modulate RF signal with the two-tone sequence.
5. The message light will come on and the squelch will open.

Example: Suppose the following frequencies were needed:

TONE A - 349.0
TONE B - 389.0
TONE C - 410.8

Using an accurate frequency counter -

The reading at Pin 1 of IC301 must be adjusted to 8 x 349.0 Hz = 2,792 Hz. The adjustment is done with R301.
The order of the next two Tones B and C is unimportant.

With the probe on Pin 2 of IC302 and JO301 pulled up, adjust R318 for eight times one of the other tones - say Tone C, 8 x 410.8 Hz = 3,286.4 Hz. Now ground the jumper against the case and adjust R320 for 8 x 389.0 Hz = 3,112 Hz.
Now adjust the inter-tone timing according to your requirements. Suppose the period of the first tone is .75 sec. and the period between tones is .5 sec the final tone is also .75 sec, then

One shot period = period of 1st tone + period delay + period 2nd tone

$$= .75s + .5s + 75s = 2s$$

The adjustment is made with R317 and set with the scope probe on Pin 17 of IC303.

To do the same example problem with an oscilloscope instead of a frequency counter -

$$t_{oscA} = \frac{1}{8 \times f_A} = .358 \times 10^{-6}$$

Set the scope for about 50×10^{-6} s/Div

Then divide $\dfrac{.358 \times 10^{-6}\ s}{\dfrac{50 \times 10^{-6}\ s}{Div}}$ = 7.16 Div - for one cycle

The other two tones are set in the same fashion.

DRAWN	DATE	SIZE	PART NUMBER	REV.
APPROVED Ron C. Ramm	DATE 11/1/78	A	TP14-219	A
DO NOT SCALE DWG.		SCALE		SHEET 3

E. Unit Testing

1. With Carrier Reset Option -
   a. Set alert/monitor switch into monitor position.
   b. With no RF signal applied, adjust squelch for desired squelching action.
   c. Return alert/monitor switch back to the alert position.
   d. Apply enough RF signal to quiet the receiver and signal the unit with the proper two-tone sequence.
   e. The squelch should open allowing the listener to hear the remainder of the second tone's duration and the message lamp should flash at a high rate.
   f. Turn off applied RF signal so that the radio goes into the squelched mode. The decoder is now reset and no other signal other than the proper two-tone sequence will open the squelch.
   g. The MSG LED should remain flashing until the reset switch is moved into the reset position.

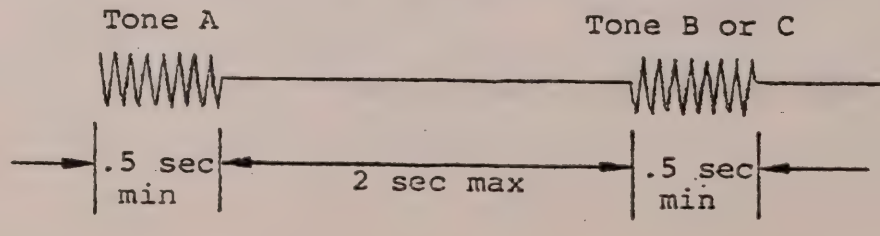
2. With Time-Out Reset Option -
   a. Turn up RF signal enough to quiet the receiver.
   b. Modulate the signal generator with the proper two-tone sequence.
   c. The squelch should open, allowing the receiver to operate normally for a given period of time. This time period can be adjusted by varying R293. The MSG LED will be flashing at a very fast rate and will remain flashing when the decoder has been reset.
   d. The MSG LED can be reset by pushing the reset switch to the right.

F. Acceptable Performance Limits

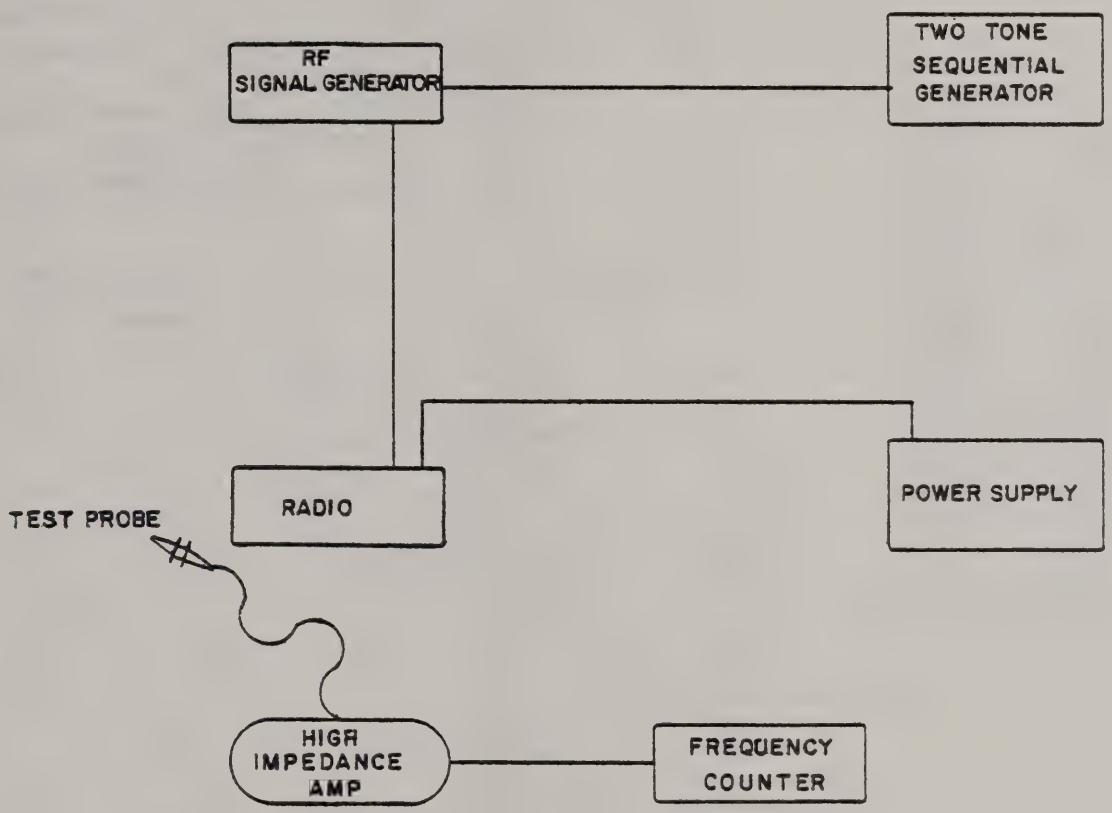
Frequency Range *	208 - 3,906 Hz
Frequency Counter will read	1,664.- 31,248.
Decoder Sensitivity	12dB Sinad 100% detect 6dB Sinad 75% detect
Audio Input at Pin 6 of IC303 must be	1.3Vpp or greater

*For tone frequencies lower than 300 Hz it may be necessary to change C301, C316 or C317 respectively to 820pf for those oscillators below 300 Hz only.

PROPER TONE SEQUENCE



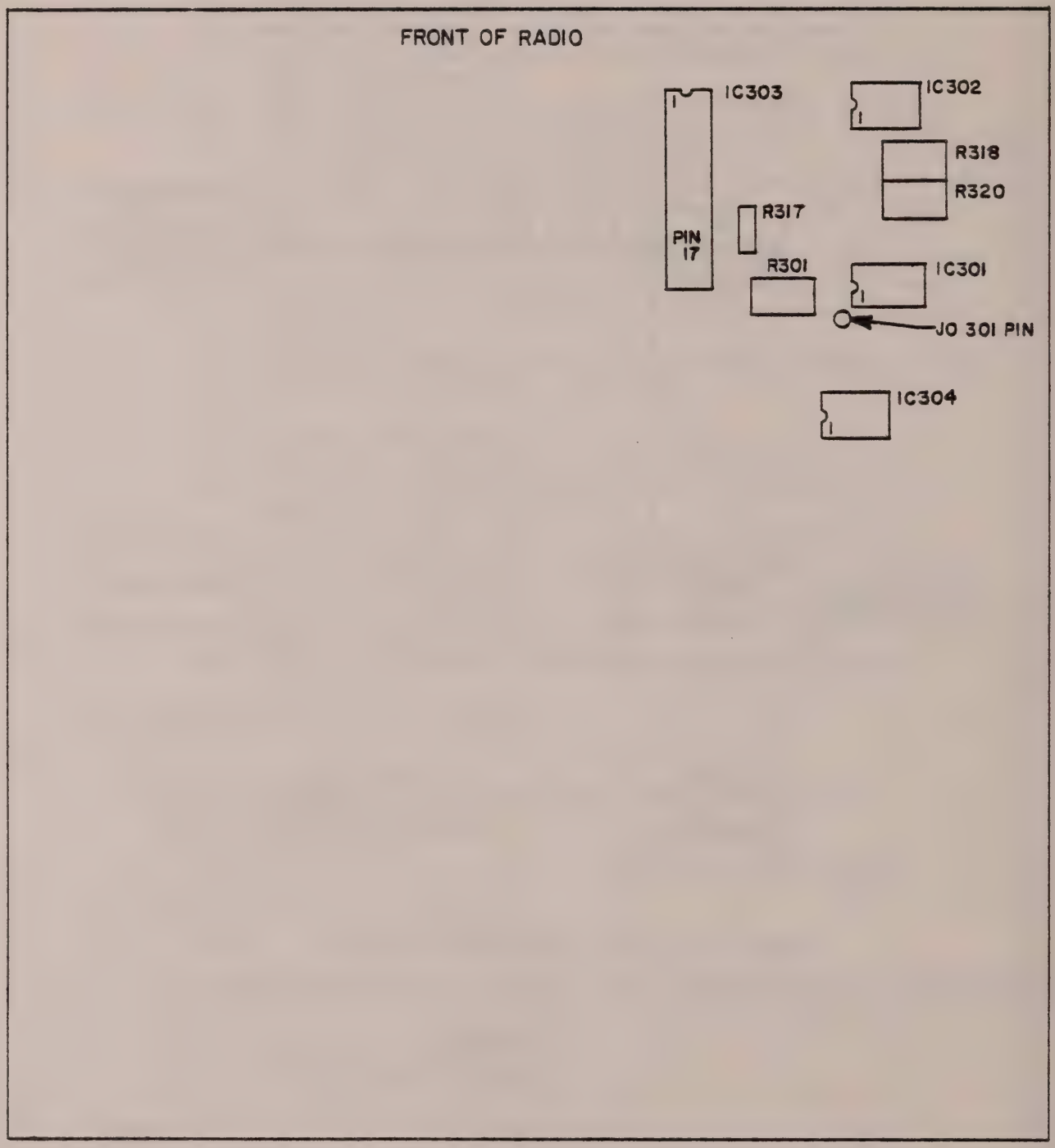
DRAWN	DATE	SIZE	PART NUMBER	REV.
APPROVED Linda A. Ramsey	DATE 7/12/94	A	TP14-219	A
DO NOT SCALE DWG.		SCALE		SHEET 4



TEST INTERCONNECTION DIAGRAM

FIGURE - 1

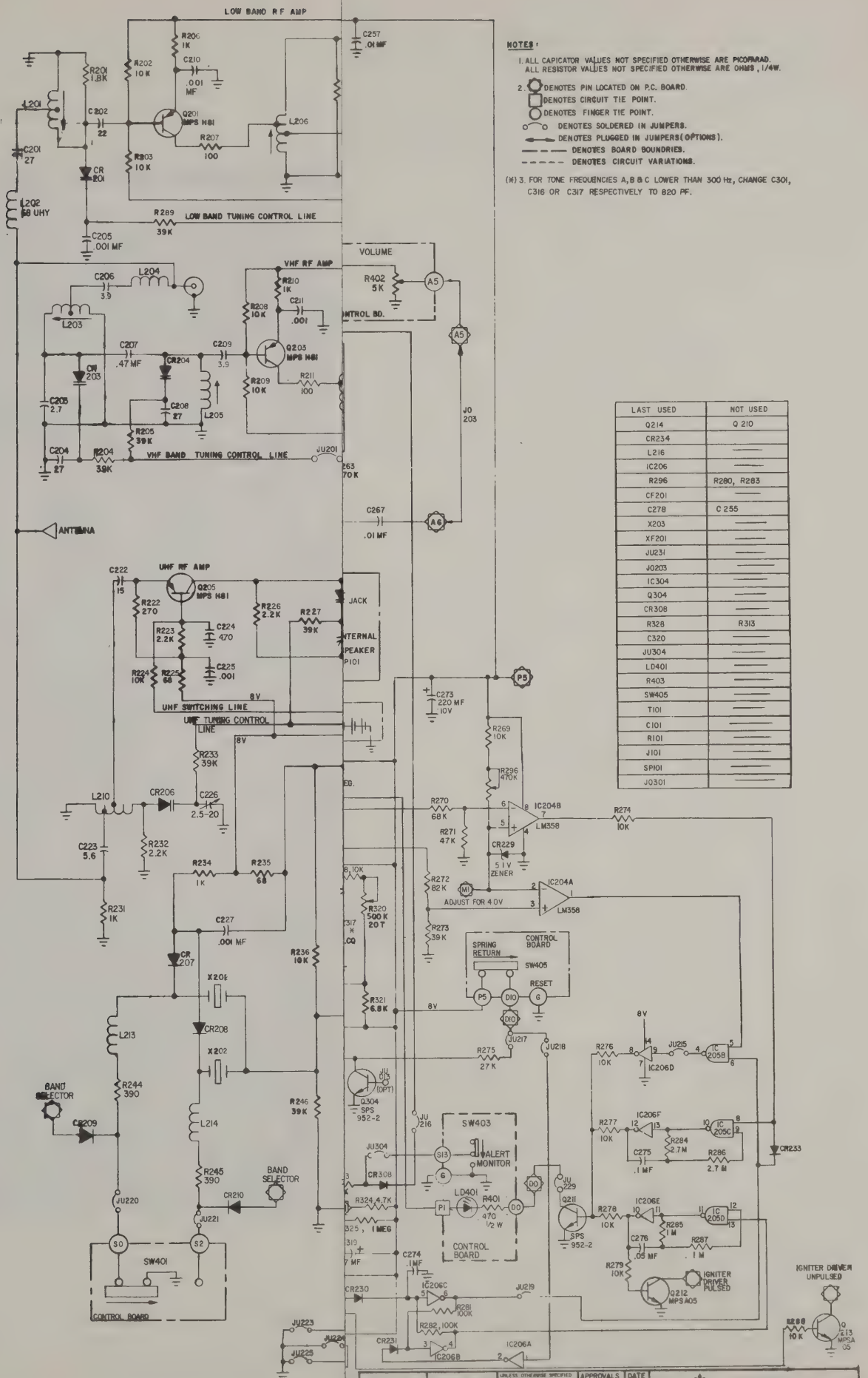
DRAWN	DATE	SIZE	PART NUMBER	REV.
APPROVED Ron C. Kerns	DATE 11/12/82	A	TP14-219	A
DO NOT SCALE DWG.		SCALE		SHEET 5



TWO TONE DECODER

FIGURE – 2

DRAWN	DATE	SIZE	PART NUMBER	REV.
APPROVED Penn - Penn	DATE 11/12/98	A	TP14-219	A
DO NOT SCALE DWG.		SCALE		SHEET 6



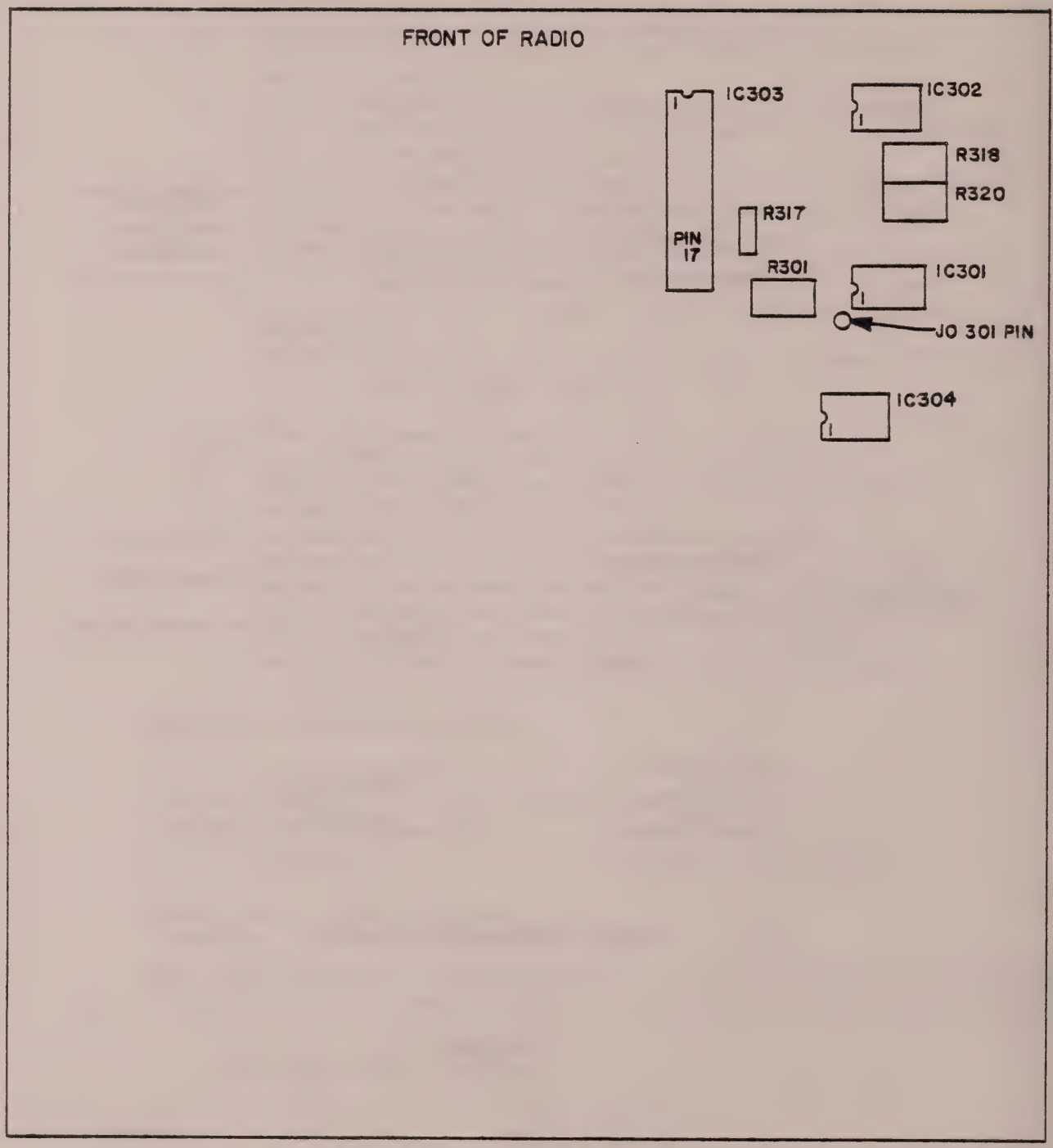
NOTES:

1. ALL CAPICATOR VALUES NOT SPECIFIED OTHERWISE ARE PICOFARAD. ALL RESISTOR VALUES NOT SPECIFIED OTHERWISE ARE OHMS, 1/4W.
2. DENOTES PIN LOCATED ON P.C. BOARD.
   DENOTES CIRCUIT TIE POINT.
   DENOTES FINGER TIE POINT.
   DENOTES SOLDERED IN JUMPERS.
   DENOTES PLUGGED IN JUMPERS(OPTIONS).
   DENOTES BOARD BOUNDRIES.
   DENOTES CIRCUIT VARIATIONS.

(M) 3. FOR TONE FREQUENCIES A, B & C LOWER THAN 300 Hz, CHANGE C301, C316 OR C317 RESPECTIVELY TO 820 PF.

LAST USED	NOT USED
Q214	Q 210
CR234	
L216	
IC206	
R296	R280, R283
CF201	
C278	C 255
X203	
XF201	
JU231	
J0203	
IC304	
Q304	
CR308	
R328	R313
C320	
JU304	
LD401	
R403	
SW405	
T101	
C101	
R101	
J101	
SP101	
J0301	

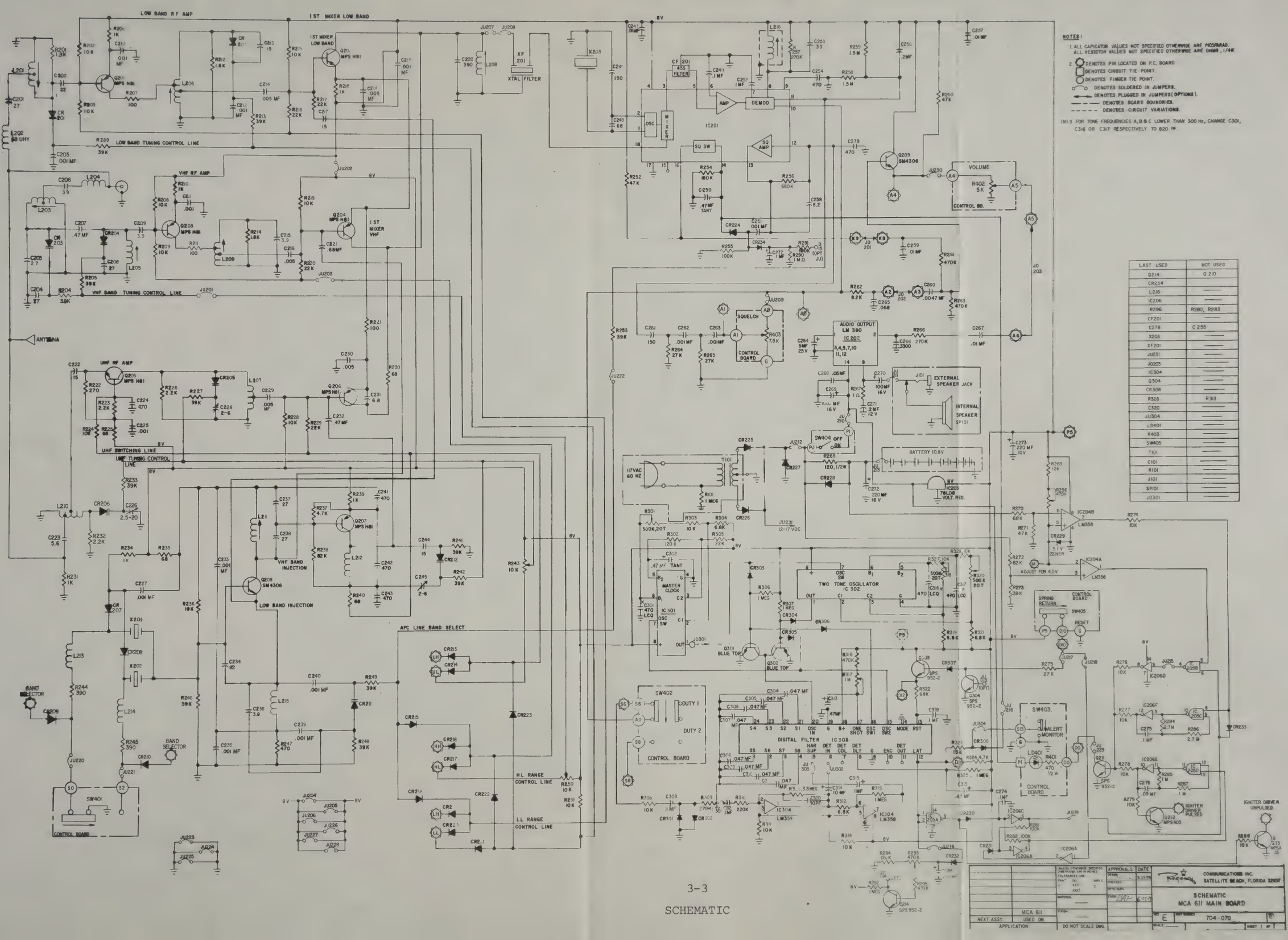
		UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES. TOLERANCES ARE FRACT DEC ANGLE ± .XX° ±	APPROVALS	DATE	COMMUNICATIONS INC. SATELLITE BEACH, FLORIDA 32937
			DRAWN	3-15-78	
			CHECKED		SCHEMATIC MCA 611 MAIN BOARD
			OPTS SUPV		
		MATERIAL	ENGR		
	MCA 611	FINISH			REV E PART NUMBER 704-070 REV
NEXT ASSY	USED ON				SCALE SHEET 1 OF 1
APPLICATION		DO NOT SCALE DWG.			



TWO TONE DECODER

FIGURE – 2

DRAWN	DATE	SIZE	PART NUMBER	REV.
APPROVED	DATE 11/12/79	A	TP14-219	A
DO NOT SCALE DWG.		SCALE		SHEET 6



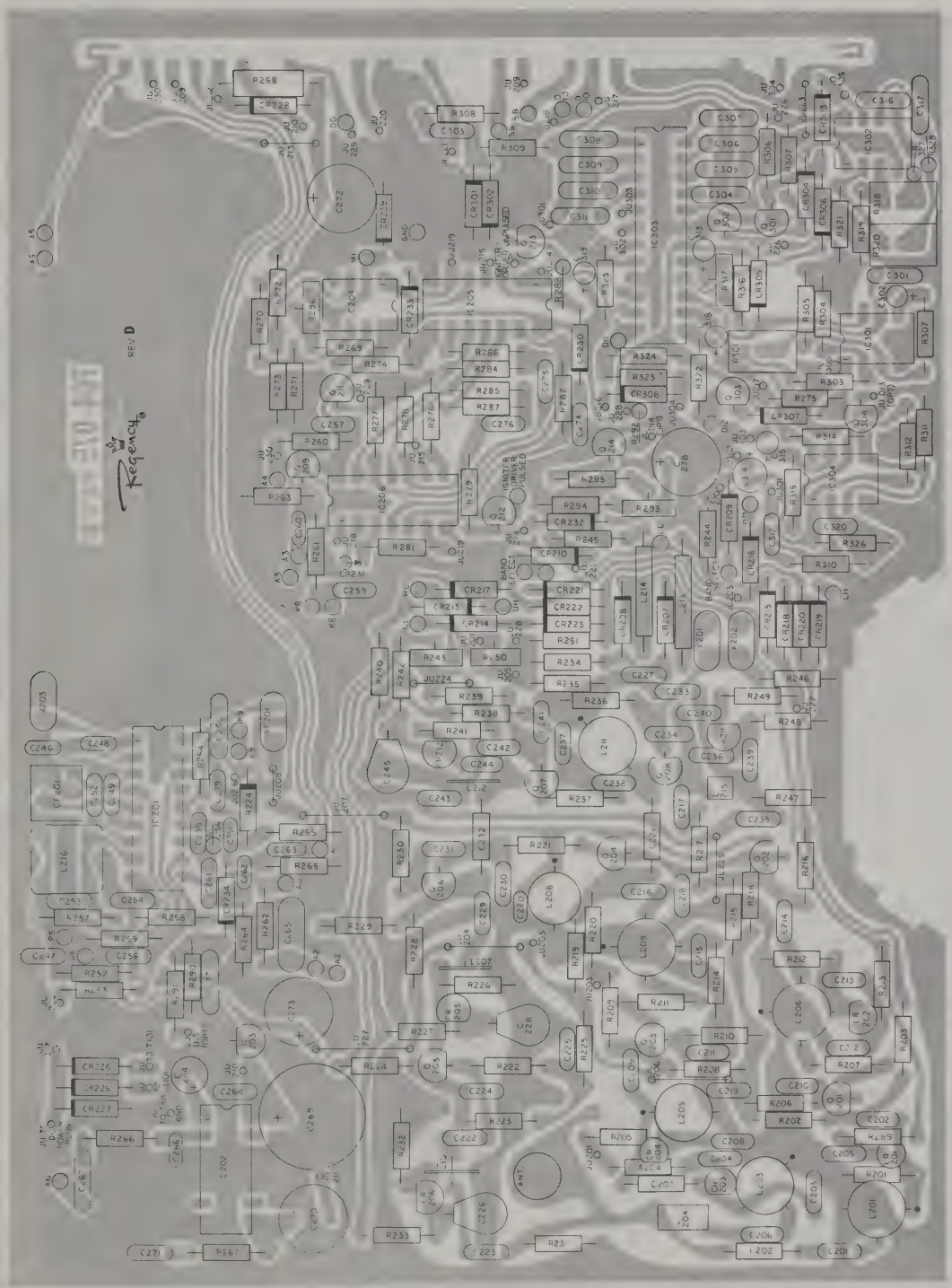
NOTES:

1. ALL CAPACITOR VALUES NOT SPECIFIED OTHERWISE ARE MICROFARAD. ALL RESISTOR VALUES NOT SPECIFIED OTHERWISE ARE OHMS, 1/4W.
2. ⬡ DENOTES PIN LOCATED ON P.C. BOARD
   ▢ DENOTES CIRCUIT TIE POINT.
   ▢ DENOTES FINGER TIE POINT.
   ○○ DENOTES SOLDERED IN JUMPERS.
   ⊸ DENOTES PLUGGED IN JUMPERS(OPTIONS).
   ——— DENOTES BOARD BOUNDRIES.
   - - - - DENOTES CIRCUIT VARIATIONS.

(W) 3 FOR TONE FREQUENCIES A, B & C LOWER THAN 300 Hz, CHANGE C301, C316 OR C317 RESPECTIVELY TO 820 PF.

LAST USED	NOT USED
Q214	Q 210
CR234	——
L216	——
IC206	——
R296	R280, R283
CF201	——
C278	C 255
X203	——
XF201	——
JU231	——
J0203	——
IC304	——
Q304	——
CR308	——
R328	R313
C320	——
JU304	——
LD401	——
R403	——
SW405	——
TI01	——
C101	——
R101	——
J101	——
SPI01	——
J0301	——

			UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES. TOLERANCES ARE: FRACT ±1/64, .X ±.1, .XXX ±.005	APPROVALS	DATE	COMMUNICATIONS INC. SATELLITE BEACH, FLORIDA 32937	
				DRAWN	3-13-75		
				CHECKED		SCHEMATIC MCA 611 MAIN BOARD	
				QUALITY			
				MATERIAL		SIZE E	DWG NUMBER 704-070
				FINISH		SCALE	SHEET 1 OF
NEXT ASSY	USED ON	MCA 611					
APPLICATION		DO NOT SCALE DWG.					



TOP VIEW

BOTTOM VIEW

PARTS LIST

RECEIVER

CAPACITORS

LOCATION	DESCRIPTION	PART NUMBER
C201	27pf 10 NPO 50V	1500-0270-650
C202	22pf 10 NPO 500V	1500-0220-605
C203	2.7pf NPO 500V	1500-0279-205
C204	27pf 10 NPO 50V	1500-0270-650
C205	.001 mf +8-2 50V	1503-0102-003
C206	3.9pf 10 NPO 500V	1500-0399-905
C207	.47pf 10 Type MC	1510-0478-900
C208	27pf 10 NPO 50V	1500-0270-650
C209	3.9pf 10 NPO 500V	1500-0399-905
C210	.001mf +8-2 50V	1503-0102-003
C211	.001mf +8-2 50V	1503-0102-003
C212	.001mf +8-2 50V	1503-0102-003
C213	15pf 10 NPO 500V	1500-0150-605
C214	.005mf +8-2 50V	1503-0502-005
C215	3.9pf 10 NPO 500V	1500-0399-905
C216	.005mf +8-2 50V	1503-0502-005
C217	15pf 10 NPO 500V	1500-0150-605
C218	.005mf +8-2 50V	1503-0502-005
C219	.001mf +8-2 50V	1503-0102-003
C220	390pf 50V 5 LCQ-17	1506-0391-550
C221	.68pf 10 Type MC209	1510-0688-900
C222	15pf 10 NPO 500V	1500-0150-605
C223	5.6pf 10 NPO 500V	1500-0569-905
C224	470 pf 20 50V Z5F	1523-0471-002
C225	.001mf +8-2 50V	1503-0102-003
C226	Trim 2.5 -20pf	1517-0000-034
C227	.001mf +8-2 50V	1503-0102-003
C228	Trim 2-6pf	1517-0000-035
C229	.005mf +8-2 50V	1503-0502-005
C230	.005mf +8-2 50V	1503-0502-005
C231	6.8pf 10 NPO 500V	1500-0689-905
C232	.47pf 10 Type MC	1510-0478-900
C233	.001mf +8-2 50V	1503-0102-003
C234	82pf 5 NPO 50V	1524-0820-002
C235	.001mf +8-2 50V	1503-0102-003
C236	3.9pf 10 NPO 500V	1500-0399-905
C237	27pf 10 NPO 50V	1500-0270-650
C238	27pf 10 NPO 50V	1500-0270-650
C239	.001mf +8-2 50V	1503-0102-003
C240	.001mf +8-2 50V	1503-0102-003
C241	470pf 20 50V Z5F	1523-0471-002
C242	470pf 20 50V Z5F	1523-0471-002
C243	470pf 20 50V Z5F	1523-0471-002
C244	15pf 10 NPO 500V	1500-0150-605
C245	Trim 2-6pf	1517-0000-035
C246	150pf 50V 5 LCQ-17	1506-0151-550
C247	.01mf +8-2 50V	1503-0103-007
C248	68pf 5 NPO 50V	1524-0680-002
C249	.1mf +8-2 50V	1503-0104-010
C250	.47mf 15V 20	1515-0478-003

LOCATION	DESCRIPTION	PART NUMBER
C251	.001mf 10 100V	1508-0102-610
C252	.1mf +8-2 50V	1503-0104-010
C253	33pf 10 NPO 500V	1500-0330-605
C254	470pf 20 50V Z5F	1523-0471-002
C255	not used	
C256	.2mf+8-2 12V	1502-0204-006
C257	.01mf +8-2 50V	1503-0103-007
C258	8.2pf 10 NPO 500V	1500-0829-905
C259	.01mf +8-2 50V	1503-0103-007
C260	.0047mf 10 100V	1508-0472-610
C261	150pf 5 50V LCQ-17	1506-0151-550
C262	.001mf 10 100V	1508-0102-610
C263	.001mf 10 100V	1508-0102-610
C264	5mf 25V Type U	1513-0050-003
C265	.068mf 10 100V	1508-0683-610
C266	.0033mf 10 100V	1508-0332-610
C267	.01mf +8-2 50V	1503-0103-007
C268	.05mf +8-2 25V	1502-0503-003
C269	1000mf 15V Type U	1513-0102-002
C270	100mf 16V 85D Type U	1513-0101-002
C271	.2mf +8-2 12V	1502-0204-006
C272	220mf 16V 85D	1513-0221-002
C273	220mf 10V 85D Type U	1513-0221-001
C274	.1uf +80-20 12V	1502-0104-006
C275	.1pf +80-20 12V	1502-0104-006
C276	.05mf +8-2 25V	1501-0503-003
C277	1mf 15V 20 tant	1515-0010-003
C278	220mf 10V 85D Type U	1513-0221-002

COIL

L201	coil	1800-3152-013
L202	choke .68uhy Wilco	1802-0688-003
L203	coil TMRH RF Ant	1800-3152-001
L204	choke LM-2	1803-5125-903
L205	RF Input	1800-3152-002
L206	coil	1800-3152-012
L207	coil	1800-3160-006
L208	coil RF (Wht)	1800-3191-401
L209	coil	1800-3152-014
L210	Loop (T)	1800-3160-004
L211	coil	1800-3152-009
L212	Osc 450MHz	1800-3160-003
L213	choke 12 µhy	1803-1313-100
L214	choke 12 µhy	1803-1313-100
L215	coil TMR	1801-1236-900
L216	coil	1800-6055-801

INTEGRATED CIRCUITS

LOCATION	DESCRIPTION	PART NUMBER
IC201	IF Sub Sys	3130-6056-500
IC202	Nat LM 380N	3130-3157-614
IC203	78-L08 8V	3130-0000-014
IC204	LM358N	3130-3167-909
IC205	MC14011 CP	3130-3157-628
IC206	MM 74C04N	3130-3157-617

RESISTORS (All resistors are ¼W 5% unless otherwise noted)

R201	1.8K	4704-0182-032
R202	10K	4704-0103-032
R203	10K	4704-0103-032
R204	39K	4704-0393-032
R205	39K	4704-0393-032
R206	1K	4704-0102-032
R207	100 ohm	4704-0101-032
R208	10K	4704-0103-032
R209	10K	4704-0103-032
R210	1K	4704-0102-032
R211	100 ohm	4704-0101-032
R212	1.8K	4704-0182-032
R213	39K	4704-0393-032
R214	1.8K	4404-0182-032
R215	10K	4704-0103-032
R216	22K	4704-0223-032
R217	22K	4704-0223-032
R218	1K	4704-0102-032
R219	10K	4704-0103-032
R220	22K	4704-0223-032
R221	100 ohm	4704-0101-032
R222	270 ohm	4704-0271-032
R223	2.2K	4704-0222-032
R224	10K	4704-0103-032
R225	68 ohm	4704-0680-032
R226	2.2K	4704-0222-032
R227	39K	4704-0393-032
R228	10K	4704-0103-032
R229	22K	4704-0223-032
R230	68 ohm	4704-0680-032
R231	1K	4704-0102-032
R232	2.2K	4704-0222-032
R233	39K	4704-0393-032
R234	1K	4704-0102-032
R235	68 ohm	4704-0680-032
R236	10K	4704-0103-032
R237	4.7K	4704-0472-032
R238	82K	4704-0823-032
R239	1K	4704-0102-032
R240	68 ohm	4704-0680-032
R241	39K	4704-0393-032
R242	39K	4704-0393-032
R243	10K var	4751-0103-002
R244	390 ohm	4704-0391-032

LOCATION	DESCRIPTION	PART NUMBER
R245	390 ohm	4704-0391-032
R246	39K	4704-0393-032
R247	470 ohm	4704-0471-032
R248	39K	4704-0393-032
R249	39K	4704-0393-032
R250	10K var	4751-0103-002
R251	10K	4704-0103-032
R252	47K	4704-0473-032
R253	39K	4704-0393-032
R254	180K	4704-0184-032
R255	100K	4704-0104-032
R256	680K	4704-0684-032
R257	270K	4704-0274-032
R258	1.5 meg	4704-0155-032
R259	1.5 meg	4704-0155-032
R260	47K	4704-0473-032
R261	470K	4704-0474-032
R262	8.2K	4704-0822-032
R263	470K	4704-0474-032
R264	27K	4704-0273-032
R265	27K	4704-0273-032
R266	270K	4704-0274-032
R267	3.3 ohm	4704-0339-032
R268	120 ohm ½W 5%	4704-0121-034
R269	10K	4704-0103-032
R270	68K	4704-0683-032
R271	47K	4704-0473-032
R272	68K	4704-0683-032
R273	27K	4704-0273-032
R274	10K	4704-0103-032
R275	27K	4704-0273-032
R276	10K	4704-0103-032
R277	10K	4704-0103-032
R278	10K	4704-0103-032
R279	10K	4704-0103-032
R280	not used	
R281	100K	4704-0104-032
R282	100K	4704-0104-032
R283	not used	
R284	2.7 meg	4704-0275-032
R285	1 meg	4704-0105-032
R286	2.7 meg	4704-0275-032
R287	1 meg	4704-0105-032
R288	10K	4704-0103-032
R289	39K	4704-0393-032
R290	1 meg	4704-0105-032
R291	100K	4704-0104-032
R292	1 meg	4704-0105-032
R293	470K var	4751-0474-002
R294	120K	4704-0124-032
R295	470K	4704-0474-032
R296	470K var	4751-0474-002

TRANSISTORS

LOCATION	DESCRIPTION	PART NUMBER
Q201	MPS H81 PNP	4801-0000-026
Q202	MPS H81 PNP	4801-0000-026
Q203	MPS H81 PNP	4801-0000-026
Q204	MPS H81 PNP	4801-0000-026
Q205	MPS H81 PNP	4801-0000-026
Q206	MPS H81 PNP	4801-0000-026
Q207	MPS H81 PNP	4801-0000-026
Q208	SM-4306-5	4801-0000-100
Q209	SPS-952-2	4801-0000-016
Q210	not used	
Q211	SPS-952-2	4801-0000-016
Q212	MPS A05	4801-0000-005
Q213	MPS A05	4801-0000-005
Q214	SPS-952-2	4801-0000-016

DIODES

CR201	MV1172	4809-0000-001
CR202	MV1172	4809-0000-001
CR203	MV2201	4809-0000-004
CR204	MV2201	4809-0000-004
CR205	MV2201	4809-0000-004
CR206	MV2201	4809-0000-004
CR207	IN4148	4805-1241-200
CR208	IN4148	4805-1241-200
CR209	IN4148	4805-1241-200
CR210	IN4148	4805-1241-200
CR211	MV1172	4809-0000-001
CR212	MV2201	4809-0000-004
CR213	IN4148	4809-1241-200
CR214	IN4148	4809-1241-200
CR215	IN4148	4809-1241-200
CR216	IN4148	4809-1241-200
CR217	IN4148	4809-1241-200
CR218	IN4148	4809-1241-200
CR219	IN4148	4809-1241-200
CR220	IN4148	4809-1241-200
CR221	IN4148	4809-1241-200
CR222	IN4148	4809-1241-200
CR223	IN4148	4809-1241-200
CR224	IN4148	4809-1241-200
CR225	IN4002	4806-0000-004
CR226	IN4002	4806-0000-004
CR227	IN4002	4806-0000-004
CR228	IN4002	4806-0000-004
CR229	Zener 5.1V IN5231B	4808-0000-031
CR230	IN4148	4805-1241-200
CR231	IN4148	4805-1241-200
CR232	IN4148	4805-1241-200
CR233	IN4148	4805-1241-200
CR234	IN4148	4805-1241-200

LOCATION	DESCRIPTION	PART NUMBER
CRYSTAL		
X203	Crystal 10.245 MHz	2301-3151-601
CRYSTAL FILTER		
XF201	Xtal filt. 2P 10.7 MHz	2705-3232-200
CERAMIC FILTER		
CF201	Cer filter CFU455D2	2700-3209-500

DECODER

CAPACITORS

LOCATION	DESCRIPTION	PART NUMBER
C301	470pf 50V LCQ-17	1506-0471-550
C302	.47mf 15V 20	1515-0478-003
C303	.1mf 50V +8-2 Y5B	1503-0104-010
C304	.047mf 100V 10	1508-0473-610
C305	.047mf 100V 10	1508-0473-610
C306	.047mf 100V 10	1508-0473-610
C307	.047mf 100V 10	1508-0473-610
C308	.047mf 100V 10	1508-0473-610
C309	.047mf 100V 10	1508-0473-610
C310	.047mf 100V 10	1508-0473-610
C311	.047mf 100V 10	1508-0473-610
C312	.1uf 12V +80-20 BC-12	1502-0104-006
C313	1mf 15V	1515-0010-003
C314	10mf 10V 85D III Type U	1513-0100-001
C315	1mf 16V 85D III Type U	1513-0010-002
C316	470pf 50V LCQ-17	1506-0471-550
C317	470pf 50V LCQ-17	1506-0471-550
C318	1mf 15V 20 T360	1515-0010-003
C319	.47mf 15V 20	1515-0478-003
C320	10pf NPO 500V	1501-0100-001

INTEGRATED CIRCUITS

IC301	2 tone osc SC74204	3130-6060-700
IC302	2 tone osc SC74204	3130-6060-700
IC303	2 tone dig fil SC74203	3130-6062-000
IC304	LM358N	3130-3167-909

RESISTORS

R301	500K var	4751-5429-005
R302	120K	4704-0124-032
R303	10K	4704-0103-032
R304	6.8K	4704-0682-032
R305	22K	4704-0223-032
R306	1 meg	4704-0105-032
R307	1 meg	4704-0105-032
R308	10K	4704-0103-032
R309	270K	4704-0274-032
R310	220K	4704-0224-032
R311	10K	4704-0103-032
R312	6.8K	4704-0682-032
R313	not used	
R314	10K	4704-0103-032

LOCATION	DESCRIPTION	PART NUMBER
R315	1 meg	4704-0105-032
R316	470K	4704-0474-032
R317	1 meg var	4751-0105-002
R318	500K var	4751-5429-005
R319	6.8K	4704-0682-032
R320	500K var	4751-5429-005
R321	6.8K	4704-0682-032
R322	68K	4704-0683-032
R323	15K	4704-0153-032
R324	4.7K	4704-0472-032
R325	1 meg	4704-0105-032
R326	3.3 meg	4704-0335-032
R327	10K	4704-0103-032
R328	10K	4704-0103-032

TRANSISTORS

Q301	SPS 1476 Blue Top	4801-0000-003
Q302	SPS 1476 Blue Top	4801-0000-003
Q303	SPS-952-2	4801-0000-016
Q304	SPS-952-2	4801-0000-016

DIODES

CR301	IN4148	4805-1241-200
CR302	IN4148	4805-1241-200
CR303	Diode Germ	4807-1233-900
CR304	Diode Germ	4807-1233-900
CR305	Diode Germ	4807-1233-900
CR306	Diode Germ	4807-1233-900
CR307	IN4148	4805-1241-200
CR308	IN4148	4805-1241-200

CONTROL BOARD

RESISTORS (All resistors are ¼W 5% unless otherwise noted)

R401	470 ohm ½W	4704-0471-034
R402	5K var	4752-5135-302
R403	7.5K var	4752-5135-307

SWITCHES

SW401	switch, slide SPDT	5113-3231-601
SW402	switch, slide SPDT	5113-3231-601
SW403	switch, slide	5113-5135-203
SW404	switch, slide	5113-5135-203
SW405	switch SPDT	5113-3231-501

DIODE

LD401	Diode LED Red	4810-1282-900

CHASSIS

LOCATION	DESCRIPTION	PART NUMBER
R101	resistor 1 meg	4701-0105-044
T101	transformer	5604-5100-600
SP101	spkr 2 x 6 8 ohm	1301-5101-000